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(71)Applicant : HITACHI LTD

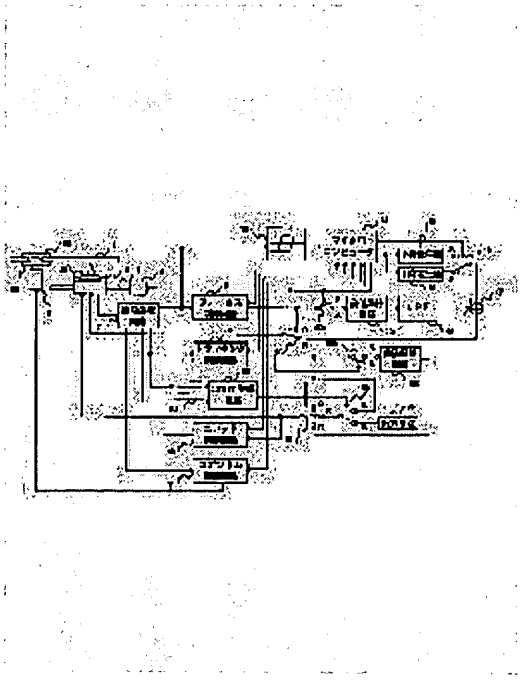
(72)Inventor : TADA YUKINOBU
KANIWA KOUJI
AZUMA JIRO
SOUMA KAZUAKI

(54) OPTICAL DISK DEVICE

(57)Abstract:

PROBLEM TO BE SOLVED: To control a rise or a fall voltage required for a layer jump and to stabilize the layer jump by making possible always applying a suitable acceleration voltage for a wobbly surface or a noise and suitably detecting a layer switching point.

SOLUTION: When a microcomputer 13 switches focus control to the control by a feedback loop for focusing a focal point on a recording surface of a layer jumped layer, a changeover switch 21 is switched to a B side. At this time, the changeover switch 19b switches whether the feedback loop is closed by outputting a tracking drive signal of an objective lens 26 generated by a tracking control circuit 9 by a signal generated in a COUT generation circuit 25 (A side), or an output neutral point is selected by outputting an output zero signal outputted from a drive output neutral point circuit 23 (B side). The output of the tracking drive signal is controlled using the COUT signal, and the matter that the objective lens is moved needlessly in the tracking direction occurring in the layer jump is suppressed.



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* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1] In the optical disk unit with which two or more layers with the recording surface which reads information in field of one of the two reproduce or play [record] a certain disk optically The objective lens for doubling the focus of a laser beam with the recording surface of a disk, While moving this objective lens in the direction perpendicular to the recording surface of a disk and doubling the focus of an objective lens with the recording surface of a disk, it has at least a migration means (3) to move this objective lens in the direction level to the recording surface of a disk, and to make an objective lens trace on the pit on a recording surface. A noise rejection means to remove the noise component of a signal which makes this objective lens drive in the direction perpendicular to the recording surface of a disk (14), The electrical-potential-difference means for switching which switches a driver voltage value required in order to bring this objective lens close to a disk front face, and a driver voltage value required in order to keep away an objective lens (18), An addition means to add the output of said noise rejection means, and the output of said electrical-potential-difference means for switching (17), The layer change-over check appearance means and (12) which detect the signal produced when moving to another layer from a certain layer with said recording surface, The control means and (13) which control said electrical-potential-difference means for switching by the detecting signal of this layer change-over check appearance means, the tracking error signal showing the amount of gaps with the pit top of said objective lens and said objective lens are needed on a pit and a land -- with a signal generation means (25) to generate a signal from phase relation with that distinction signal It has the change means (19b) which switches the output which intercepted the output and this output of the driving signal which makes said objective lens trace on a pit horizontally to a disk with the output signal of said signal generation means. By adding an electrical-potential-difference value to the driving signal of the perpendicular direction of the objective lens from which the noise component was removed with said noise rejection means by said electrical-potential-difference means for switching, and giving said migration means of said objective lens, in case it moves to the focusing point of other layers from the layer which is already in a focusing point Said objective lens is compulsorily moved in the direction of other layers. With said layer change-over check appearance means The electrical-potential-difference value which the layer of the recording surface produced in the case of migration switches, and is given to the migration means of an objective lens in a point is controlled by said electrical-potential-difference means for switching. And the optical disk unit characterized by controlling the horizontal driving signal of an objective lens by said change means, and giving the output of this change means to said migration means when it moves to other layers.
[Claim 2] It is the optical disk unit characterized by for said layer change-over check appearance means (12) having a hysteresis in an optical disk unit according to claim 1, and detecting the zero crossing point of the serpentine curve of a focal error signal.
[Claim 3] In an optical disk unit according to claim 1 said control means (13) It switches to the fixed electrical-potential-difference value which makes an objective lens drive so that it may bring close to a disk until the switching point of a layer is detected when moving to another back layer from a disk front

face. It controls to switch to the fixed electrical-potential-difference value which makes an objective lens drive so that it may keep away from a disk, if the switching point of a layer is detected. Moreover, it switches to the fixed electrical-potential-difference value which makes an objective lens drive so that it may keep away from a disk until the switching point of a layer is detected when moving to another surface layer from the disk back. The optical disk unit characterized by controlling to switch to the fixed electrical-potential-difference value which makes an objective lens drive so that it may bring close to a disk, if the switching point of a layer is detected.

[Claim 4] In the optical disk unit with which two or more layers with the recording surface which reads information in field of one of the two reproduce or play [record] a certain disk optically The objective lens for doubling the focus of a laser beam with the recording surface of a disk, This objective lens It has at least a migration means (3) to move the migration means (3) and this objective lens which are moved in the direction perpendicular to the recording surface of a disk, and double the focus of an objective lens with the recording surface of a disk in the direction level to the recording surface of a disk, and to make an objective lens trace on the pit on a recording surface. the tracking error signal and this objective lens showing the amount of gaps with the pit top of this objective lens are needed on a pit and a land -- with a means (25) to generate a signal from phase relation with that distinction signal A means to generate the driving signal for making a pit top trace this objective lens horizontally to a disk (9), The 1st change means switched with the signal which generated a means (22b) to hold the output of the generated this driving signal, and the output which intercepted the output and this output of the driving signal for making this objective lens trace on a pit horizontally to a disk from this phase relation (19b), this -- the signal outputted from the 1st change means, and this objective lens with the driving signal for making a pit top trace horizontally to a disk The 2nd change means which switches the signal holding this driving signal output (21), Resemble a means (13) to control the output of the 2nd change means, and it constitutes more. this -- In case an objective lens is moved to the focusing point of other layers from the layer which is already in a focusing point The optical disk unit characterized by controlling that control the driving signal of this horizontal objective lens when carrying out migration termination under migration of an objective lens to other layers by the 1st and 2nd change means, and an objective lens moves horizontally unnecessarily.

[Claim 5] In the optical disk unit with which two or more layers with the recording surface which reads information in field of one of the two reproduce or play [record] a certain disk optically The objective lens for doubling the focus of a laser beam with the recording surface of a disk, This objective lens It has at least a migration means (3) to move the migration means (3) and this objective lens which are moved in the direction perpendicular to the recording surface of a disk, and double the focus of an objective lens with the recording surface of a disk in the direction level to the recording surface of a disk, and to make an objective lens trace on the pit on a recording surface. A means to remove the noise component of a signal which makes this objective lens drive perpendicularly (14), The means which switches the fixed electrical-potential-difference value required in order to bring an objective lens for this objective lens close to a disk front face temporarily made to drive perpendicularly, and the fixed electrical-potential-difference value required in order to keep away an objective lens made to drive perpendicularly (18), the signal which makes this objective lens from which this noise component was removed drive perpendicularly -- these change **** -- with a means (17) to add a fixed electrical-potential-difference value A means for the layer produced when moving to the layer which has another recording surface from a layer with a certain recording surface to switch, and to detect a point (12), A means to control the change means which this layer switches and switches the electrical-potential-difference value of this regularity by the detecting signal from the detection means of a point (13), A means to generate the driving signal for making a pit top trace this objective lens horizontally to a disk from the tracking error signal showing the amount of gaps with the pit top of this objective lens (9), the generated this driving signal and this objective lens are needed on a pit and a land -- with a means (25) to generate a signal from phase relation with that distinction signal The change means (19b) switched with the signal which generated the output which intercepted the output and this output of the generated this driving signal from this phase relation constitutes. An objective lens is compulsorily moved to other

layers by adding a fixed electrical-potential-difference value to the driving signal of the perpendicular direction of the objective lens from which the noise component was removed, and giving the migration means of an objective lens, in case it moves to the focusing point of other layers from the layer which is already in a focusing point. Control the fixed electrical-potential-difference value which the layer of the recording surface produced in the case of migration switches, and is given to the migration means of an objective lens in a point, and it is made for an objective lens to draw in the focusing point of the recording surface of other layers. And the optical disk unit characterized by controlling that control the horizontal driving signal of an objective lens by the change means, and an objective lens moves horizontally unnecessarily when it moves to other layers.

[Claim 6] In the optical disk unit with which two or more layers with the recording surface which reads information in field of one of the two reproduce or play [record] a certain disk optically The objective lens for doubling the focus of a laser beam with the recording surface of a disk, This objective lens It has at least a migration means (3) to move the migration means (3) and this objective lens which are moved in the direction perpendicular to the recording surface of a disk, and double the focus of an objective lens with the recording surface of a disk in the direction level to the recording surface of a disk, and to make an objective lens trace on the pit on a recording surface. A means to generate the driving signal for making a pit top trace this objective lens horizontally to a disk (9), a means (22b) to hold the output of the generated this driving signal, the this generated driving signal, and this objective lens are needed on a pit and a land -- with a means (25) to generate a signal from phase relation with that distinction signal The 1st change means switched with the signal which generated the output which intercepted the output and this output of the generated this driving signal from this phase relation (19b), this -- the signal outputted from the 1st change means, and this objective lens with the driving signal for making a pit top trace horizontally to a disk The 2nd change means which switches the signal holding this driving signal output (21), Resemble a means (13) to control the output of the 2nd change means, and it constitutes more. this -- In case an objective lens is moved to the focusing point of other layers from the layer which is already in a focusing point The optical disk unit characterized by controlling that control the driving signal of this horizontal objective lens when carrying out migration termination under migration of an objective lens to other layers by the 1st and 2nd change means, and an objective lens moves horizontally unnecessarily.

[Claim 7] In the optical disk unit with which two or more layers with the recording surface which reads information in field of one of the two reproduce or play [record] a certain disk optically The objective lens for doubling the focus of a laser beam with the recording surface of a disk, This objective lens It has at least a migration means (3) to move the migration means (3) and this objective lens which are moved in the direction perpendicular to the recording surface of a disk, and double the focus of an objective lens with the recording surface of a disk in the direction level to the recording surface of a disk, and to make an objective lens trace on the pit on a recording surface. A means to remove the noise component of a signal which makes this objective lens drive perpendicularly (14), The means which switches the fixed electrical-potential-difference value required in order to bring an objective lens for this objective lens close to a disk front face temporarily made to drive perpendicularly, and the fixed electrical-potential-difference value required in order to keep away an objective lens made to drive perpendicularly (18), the signal which makes this objective lens from which this noise component was removed drive perpendicularly -- these change **** -- with a means (17) to add a fixed electrical-potential-difference value A means for the layer produced when moving to the layer which has another recording surface from a layer with a certain recording surface to switch, and to detect a point (12), A means to control the change means which this layer switches and switches the electrical-potential-difference value of this regularity by the detecting signal from the detection means of a point (13), A means to generate the driving signal for making a pit top trace this objective lens horizontally to a disk from the tracking error signal showing the amount of gaps with the pit top of this objective lens (9), a means (39) to reverse the polarity of the generated this driving signal, the this generated driving signal, and this objective lens are needed on a pit and a land -- with a means (25) to generate a signal from phase relation with that distinction signal The change means (19b) switched with the signal which

generated the output of the generated this driving signal and the output which reversed the polarity of this driving signal from this phase relation constitutes. An objective lens is compulsorily moved to other layers by adding a fixed electrical-potential-difference value to the driving signal of the perpendicular direction of the objective lens from which the noise component was removed, and giving the migration means of an objective lens, in case it moves to the focusing point of other layers from the layer which is already in a focusing point. Control the fixed electrical-potential-difference value which the layer of the recording surface produced in the case of migration switches, and is given to the migration means of an objective lens in a point, and it is made for an objective lens to draw in the focusing point of the recording surface of other layers. And the optical disk unit characterized by controlling that control the horizontal driving signal of an objective lens by the change means, and an objective lens moves horizontally unnecessarily when it moves to other layers.

[Claim 8] In the optical disk unit with which two or more layers with the recording surface which reads information in field of one of the two reproduce or play [record] a certain disk optically The objective lens for doubling the focus of a laser beam with the recording surface of a disk, This objective lens It has at least a migration means (3) to move the migration means (3) and this objective lens which are moved in the direction perpendicular to the recording surface of a disk, and double the focus of an objective lens with the recording surface of a disk in the direction level to the recording surface of a disk, and to make an objective lens trace on the pit on a recording surface. A means to generate the driving signal for making a pit top trace this objective lens horizontally to a disk from the tracking error signal showing the amount of gaps with the pit top of this objective lens (9), A means (39) to reverse the polarity of the generated this driving signal, and a means to hold the output of the this generated driving signal (22b), the generated this driving signal and this objective lens are needed on a pit and a land -- with a means (25) to generate a signal from phase relation with that distinction signal The 1st change means switched with the signal which generated the output of the generated this driving signal, and the output which reversed the polarity of this driving signal from this phase relation (19b), this -- the signal outputted from the 1st change means, and this objective lens with the driving signal for making a pit top trace horizontally to a disk The 2nd change means which switches the signal holding this driving signal output (21), Resemble a means (13) to control the output of the 2nd change means, and it constitutes more. this -- In case an objective lens is moved to the focusing point of other layers from the layer which is already in a focusing point The optical disk unit characterized by controlling that control the driving signal of this horizontal objective lens when carrying out migration termination under migration of an objective lens to other layers by the 1st and 2nd change means, and an objective lens moves horizontally unnecessarily.

[Claim 9] In the optical disk unit with which two or more layers with the recording surface which reads information in field of one of the two reproduce or play [record] a certain disk optically The objective lens for doubling the focus of a laser beam with the recording surface of a disk, This objective lens It has at least a migration means (3) to move the migration means (3) and this objective lens which are moved in the direction perpendicular to the recording surface of a disk, and double the focus of an objective lens with the recording surface of a disk in the direction level to the recording surface of a disk, and to make an objective lens trace on the pit on a recording surface. A means to remove the noise component of a signal which makes this objective lens drive perpendicularly (14), The means which switches the fixed electrical-potential-difference value required in order to bring an objective lens for this objective lens close to a disk front face temporarily made to drive perpendicularly, and the fixed electrical-potential-difference value required in order to keep away an objective lens made to drive perpendicularly (18), the signal which makes this objective lens from which this noise component was removed drive perpendicularly -- these change **** -- with a means (17) to add a fixed electrical-potential-difference value A means for the layer produced when moving to the layer which has another recording surface from a layer with a certain recording surface to switch, and to detect a point (12), A means to control the change means which this layer switches and switches the electrical-potential-difference value of this regularity by the detecting signal from the detection means of a point (13), this tracking error signal and this objective lens are needed on a pit and a land -- with a means (25) to

generate a signal from phase relation with that distinction signal The change means switched with the signal which generated the output of this tracking error signal, and the output which intercepted this tracking error signal from this phase relation (19b), A means to generate the driving signal for making a pit top trace this objective lens horizontally to a disk from the tracking error signal outputted by this change means (9), In case it moves to the focusing point of other layers from the layer which is alike, constitutes more and is already in a focusing point An objective lens is compulsorily moved to other layers by adding a fixed electrical-potential-difference value to the driving signal of the perpendicular direction of the objective lens from which the noise component was removed, and giving the migration means of an objective lens. Control the fixed electrical-potential-difference value which the layer of the recording surface produced in the case of migration switches, and is given to the migration means of an objective lens in a point, and it is made for an objective lens to draw in the focusing point of the recording surface of other layers. And the optical disk unit characterized by controlling that control the horizontal driving signal of an objective lens by the change means, and an objective lens moves horizontally unnecessarily when it moves to other layers.

[Claim 10] In the optical disk unit with which two or more layers with the recording surface which reads information in field of one of the two reproduce or play [record] a certain disk optically The objective lens for doubling the focus of a laser beam with the recording surface of a disk, This objective lens It has at least a migration means (3) to move the migration means (3) and this objective lens which are moved in the direction perpendicular to the recording surface of a disk, and double the focus of an objective lens with the recording surface of a disk in the direction level to the recording surface of a disk, and to make an objective lens trace on the pit on a recording surface. this tracking error signal and this objective lens are needed on a pit and a land -- with a means (25) to generate a signal from phase relation with that distinction signal The 1st change means switched with the signal which generated the output of this tracking error signal, and the output which intercepted this tracking error signal from this phase relation (19b), this -- with the signal outputted from the 1st change means the 2nd change means (19c) which switches this tracking error signal -- this -- with a means (9) to generate the driving signal for making a pit top trace this objective lens horizontally to a disk from the tracking error signal outputted by the 2nd change means A means (22b) to hold the output of the generated this driving signal, and the this generated driving signal, The 3rd change means which switches the signal holding this driving signal output (21), Resemble a means (13) to control the output of the 2nd and 3rd change means, and it constitutes more. this -- In case an objective lens is moved to the focusing point of other layers from the layer which is already in a focusing point The optical disk unit characterized by controlling that control the driving signal of this horizontal objective lens when carrying out migration termination under migration of an objective lens to other layers by the 1st, 2nd, and 3rd change means, and an objective lens moves horizontally unnecessarily.

[Claim 11] In the optical disk unit with which two or more layers with the recording surface which reads information in field of one of the two reproduce or play [record] a certain disk optically The objective lens for doubling the focus of a laser beam with the recording surface of a disk, This objective lens It has at least a migration means (3) to move the migration means (3) and this objective lens which are moved in the direction perpendicular to the recording surface of a disk, and double the focus of an objective lens with the recording surface of a disk in the direction level to the recording surface of a disk, and to make an objective lens trace on the pit on a recording surface. A means to remove the noise component of a signal which makes this objective lens drive perpendicularly (14), The means which switches the fixed electrical-potential-difference value required in order to bring an objective lens for this objective lens close to a disk front face temporarily made to drive perpendicularly, and the fixed electrical-potential-difference value required in order to keep away an objective lens made to drive perpendicularly (18), the signal which makes this objective lens from which this noise component was removed drive perpendicularly -- these change **** -- with a means (17) to add a fixed electrical-potential-difference value A means for the layer produced when moving to the layer which has another recording surface from a layer with a certain recording surface to switch, and to detect a point (12), A means to control the change means which this layer switches and switches the electrical-potential-

difference value of this regularity by the detecting signal from the detection means of a point (13), A means to reverse the polarity of the tracking error signal showing the amount of gaps with the pit top of this objective lens (39), this tracking error signal and this objective lens are needed on a pit and a land -- with a means (25) to generate a signal from phase relation with that distinction signal With the signal which generated the output of this tracking error signal, and the output which reversed the polarity of this tracking error signal from this phase relation A means to generate the driving signal for making a pit top trace this objective lens horizontally to a disk from the tracking error signal outputted by the change means (19b) this change means to switch (9), In case it moves to the focusing point of other layers from the layer which is alike, constitutes more and is already in a focusing point An objective lens is compulsorily moved to other layers by adding a fixed electrical-potential-difference value to the driving signal of the perpendicular direction of the objective lens from which the noise component was removed, and giving the migration means of an objective lens. Control the fixed electrical-potential-difference value which the layer of the recording surface produced in the case of migration switches, and is given to the migration means of an objective lens in a point, and it is made for an objective lens to draw in the focusing point of the recording surface of other layers. And the optical disk unit characterized by controlling that control the horizontal driving signal of an objective lens by the change means, and an objective lens moves horizontally unnecessarily when it moves to other layers.
[Claim 12] In the optical disk unit with which two or more layers with the recording surface which reads information in field of one of the two reproduce or play [record] a certain disk optically The objective lens for doubling the focus of a laser beam with the recording surface of a disk, This objective lens It has at least a migration means (3) to move the migration means (3) and this objective lens which are moved in the direction perpendicular to the recording surface of a disk, and double the focus of an objective lens with the recording surface of a disk in the direction level to the recording surface of a disk, and to make an objective lens trace on the pit on a recording surface. A means to reverse the polarity of the tracking error signal showing the amount of gaps with the pit top of this objective lens (39), this tracking error signal and this objective lens are needed on a pit and a land -- with a means (25) to generate a signal from phase relation with that distinction signal The 1st change means switched with the signal which generated the output of this tracking error signal, and the output which reversed the polarity of this tracking error signal from this phase relation (19b), this -- with the signal outputted from the 1st change means the 2nd change means (19c) which switches this tracking error signal -- this -- with a means (9) to generate the driving signal for making a pit top trace this objective lens horizontally to a disk from the tracking error signal outputted by the 2nd change means A means (22b) to hold the output of the generated this driving signal, and the this generated driving signal, The 3rd change means which switches the signal holding this driving signal output (21), Resemble a means (13) to control the output of the 2nd and 3rd change means, and it constitutes more. this -- In case an objective lens is moved to the focusing point of other layers from the layer which is already in a focusing point The optical disk unit characterized by controlling that control the driving signal of this horizontal objective lens when carrying out migration termination under migration of an objective lens to other layers by the 1st, 2nd, and 3rd change means, and an objective lens moves horizontally unnecessarily.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the optical disk unit which reproduces or reproduces [record] a signal more nearly optically than a disk, and relates to the optical disk unit which it is reproducible or can record play the disk which has a recording surface more than two-layer from a disk front face especially.
[0002]
[Description of the Prior Art] A disk an one side monolayer, a double-sided monolayer, one side two-layer, and double-sided two-layer exists in current and the digital video disc (it calls Following DVD) standardized. Although there was only an one-layer recording surface in one side as for an old disk (it calls Following CD), for example, a compact disk, a laser disc (it calls Following LD), etc., in order to enlarge storage capacity, with DVD, the two-layer disk which has two recording surfaces in one side exists. This has the single-sided two-layer disk which made the disk which makes the recording surface to each of the 0.6mm disk of two sheets, and attached the high reflection factor film of aluminum as shown in drawing 2 (a), and the disk which attached the reflective film of translucent gold rival with a sufficient precision, and the double-sided two-layer disk which two 0.6mm disks were made to rival as shown in drawing 2 (b), and carried out multiplex [of the information] in the depth direction of each plate. In the case of this two-layer disk, information is recorded on the recording surface of each layer. As shown in drawing 2 (d), the recording surface of an optical disk is received in the objective lens in pickup. The perpendicular direction of an optical axis, i.e., the direction In the focal error signal shown in drawing 2 (c) the driving signal driven to (it is called the direction of a focus below) -- gradually -- raising (supposing that it goes up in the direction in which an objective lens also approaches a disk, if the driving signal (it is called a focal driving signal below) of the direction of a focus is raised in this case) -- It appears in the location of an objective lens with the point (it is called a focusing point below) that the focus of a lower layer (it is called a 0 horizon eye below) is correct, and if an objective lens is raised further, the focusing point of the upper layer (it is called the 1st layer below) will appear further from the location of the objective lens of a 0 horizon eye in the upper location. In short, in the case of a two-layer disk, the focusing point for every layer is doubled by making the location of an objective lens go up and down, respectively. In a case two-layer [with CD and two fields where information was recorded from one side like the above-mentioned DVD although what is necessary is just to have doubled the focusing point with the only recording surface of one side in LD], if a focusing point is not moved to the recording surface of other layers from the recording surface of the layer which is already in a focusing point, the information on which other layers are recorded cannot be read. The focusing point migration between this layer (it is called a layer jump below) applies a rise electrical potential difference and a downward electrical potential difference to the driver voltage of the direction of a focus of an objective lens, and is shifting and moving the location of an objective lens as indicated by JP,8-171731,A.
[0003]

[Problem(s) to be Solved by the Invention] However, in the above-mentioned conventional technique, in case the layer jump to the recording surface of another layer of a certain layer from a recording surface is performed, although there is description of control about the focal control to the optical disk and perpendicular direction (the direction of a focus) of an objective lens, the objective lens is not taken into consideration about the tracking control which moves to an optical disk and a horizontal direction (the direction of following tracking), and traces the pit top on a recording surface correctly.
[0004] Fundamentally, at this time, although a layer jump moves an objective lens perpendicularly to an optical disk to a disk, in order to move to the truck of the recording surface of another layer from the truck of the recording surface of a layer with which it is also related with tracking control, the control loop of tracking must be cut at the moment of performing a layer jump. When the location of the objective lens of the direction of tracking is moving to the travelling direction (from inner circumference to a periphery) instead of the middle point at this time, if control is cut, an objective lens tends to return to the middle point and vibration will be caused in the direction of tracking.
[0005] Moreover, although a layer jump is migration of a vertical objective lens, when the perpendicular direction to an optical disk performs a gap layer jump a little under the effect of a mechanical installation precision of pickup, the force of the horizontal direction of tracking, i.e., the direction, may be applied.
[0006] Time amount was taken to have been in the steady state which the force applied in the above-mentioned oscillating component or the direction of tracking influenced, and the objective lens moved in the direction of tracking unnecessarily, affected drawing in of tracking, and control became unstable, and was stabilized in this condition when it was going to apply tracking control again, and to be able to read the data of an optical disk normally.
[0007] As this invention solves the above-mentioned technical problem, and can perform a layer jump stably and carries out drawing in of the tracking at the time of layer jump termination early, it is stabilized immediately, and the information on an optical disk aims at offering the optical disk unit read and stopped.
[0008]
[Means for Solving the Problem] This invention is constituted by the means shown below in order to attain the above-mentioned purpose.
[0009] In the optical disk unit which performs playback or record playback of a disk optically The objective lens for doubling the focus of a laser beam with the recording surface of a disk, The migration means for moving this objective lens perpendicularly mostly to a disk side, and doubling the focus of an objective lens with the recording surface of a disk, and a means to generate a focal error signal from the signal acquired from this objective lens, The focal control means which generates the focal driving signal driven in order to set this objective lens by the focusing point from a focal error signal, The low pass filter from which the noise component of this focal driving signal is removed, A means to control the change of the electrical potential difference of whether to make it a means to add the fixed electrical potential difference for moving an objective lens delicately, and descend with whether pickup is raised, A means to detect the switching point of the layer of a recording surface from a focal error signal, The migration means for moving this objective lens almost horizontally to a disk side, and doubling the location of an objective lens on the pit of the recording surface of a disk, and a means to generate a tracking error signal from the signal acquired from this objective lens, The tracking control means which generates the driving signal (it is hereafter called a tracking driving signal) of the direction of tracking made to drive in order to set this objective lens on the pit of a recording surface from a tracking error signal, A means to generate the signal (for it to be hereafter called a COUT signal) acquired from the phase relation of this tracking error signal or a tracking driving signal, and that signal (it is hereafter called a mirror signal) in which it is not whether this objective lens is on a pit, The change means which switches the output of a means to intercept this tracking driving signal and this tracking driving signal with this COUT signal, Constitute, and in case it moves to the focusing point of other layers from the layer which is already in a focusing point, a rise electrical potential difference and a downward electrical potential difference are added to the focal driving signal which removed the noise component. ** --

since -- A layer jump can be carried out to stability by the layer of a recording surface switching and switching a rise electrical potential difference and a downward electrical potential difference at a point, without being influenced of face deflection or a noise. And it can control that an objective lens moves the unnecessary tracking driving signal after jumping in the direction of tracking by controlling by the change means, and drawing in of tracking control can be carried out early. Reading of the data from the optical disk after a layer jump can be carried out early.

[0010] The same effectiveness is acquired, even if it makes it a means to reverse the polarity of a tracking driving signal instead of a means to intercept a tracking driving signal furthermore and being constituted.

[0011] Moreover, the same effectiveness is acquired, even if it makes the signal inputted into the change means to switch into a tracking error signal instead of a tracking driving signal and makes it the configuration which controls this signal by the change means.

[0012]

[Embodiment of the Invention] The block diagram of drawing 1 explains one example of this invention. In drawing 1 a recording surface for 1 a certain disk and 2a more than two-layer in one side A clamper, 2b pickup and 4 for a turntable and 3 A leading screw, In 5, a thread motor and 6 a digital disposal circuit and 8 for a spindle motor and 7 A focal control circuit, 9 a thread control circuit and 11 for a tracking control circuit and 10 A spindle control circuit, A focal zero cross detector and 13 12 A microcomputer (following microcomputer), A low pass filter (henceforth, LPF) and 15 14 A rise electrical-potential-difference value setting circuit, 16 an adder and 18 for a downward electrical-potential-difference setting circuit and 17 A potential switch, 19a a circuit changing switch and 20a for a circuit changing switch and 19b An ON/OFF switch, 20b a circuit changing switch and 22a for an ON/OFF switch and 21 A before [a focal driving signal] value holding circuit, For a tracking zero cross (hereafter referred to as TZC) generation circuit, and 25, a COUT generation circuit and 26 are [22b / a before / a tracking driving signal / value holding circuit, and 23 / an output middle point setting circuit and 24] an objective lens. An outline of operation is explained below.

[0013] The disk 1 set on turntable 2a is clamper 2b, and is fixed to turntable 2a. A disk 1 rotates because a spindle motor 6 rotates.

[0014] In order to read the information on a disk, a microcomputer 13 supplies a luminescence control signal to the semiconductor laser in pickup 3. The semiconductor laser of pickup 3, and the example of a configuration of optical system and the example of a configuration of focal error signal detection of a digital disposal circuit 7 are shown in drawing 3 . For an objective lens and 27, as for semiconductor laser and 29, in drawing 3 , half prism and 28 are [1 / a disk and 26 / a photodetector and 30] the error computing elements for focal error signal generation. The flux of light which semiconductor laser 28 emits passes the half prism 27, has focused with an objective lens 26, and connects the beam spot on a disk 1. It passes along an objective lens 26 again, and is reflected by the half prism 27, and the laser reflected light from a disk 1 connects a spot to a photodetector 29. Here shows the example of a concrete configuration of detection of the focal error signal in a photodetector 29. A photodetector 29 consists of four area A, B, C, and D, on the diagonal line, constructs a pair and is connected electrically. When a disk 1 and an objective lens 26 are in a focal location, if the location of a photodetector 29 is set up so that the beam spot which carries out incidence to said photodetector 29 may become a circle, the output which amplified the addition output of the photodetector 29 on the diagonal line with the error amplifier 30 will serve as zero. If the beam spot which carries out incidence to a photodetector 29 uses becoming longwise or oblong when a disk 1 shifts up and down to the focal location of an objective lens 26 here, from the error amplifier 30, a focal error signal which is shown in drawing 4 according to the amount of gaps and the direction shifted of [from a focal location] will be detected. (The so-called astigmatism method)

In drawing 4 , an axis of abscissa is the distance of an objective lens and a disk, and an axis of ordinate is signal level. The serpentine curve of a focal error signal has the description which carries out a zero cross at the point whose focus of an objective lens suited to the disk recording surface. in addition, the polarity of this serpentine curve -- the difference in the input to the error computing element 30 --

although it can become reverse -- the case of such a system -- signal level and a disk -- it cannot be overemphasized that what is necessary is just to have a view of a variation rate reverse. The focal error signal generated with said error computing element 30 is supplied to the focal control circuit 8, performs feedback control near [in the serpentine curve of a focal error signal] a zero cross point in this focal control circuit 8, and generates and outputs the focal driving signal of an objective lens 26. This output signal is supplied to circuit-changing-switch 19a, it has switched to the stationary side (A side) by the command of a microcomputer 13 at the time of a stationary, and this circuit-changing-switch 19a is supplied as a focal driving signal of an objective lens 26. An objective lens 26 is perpendicularly controlled by this focal driving signal to a disk 1, and the condition of realizing focal control of the feedback loop and being always in a focusing point is maintained.

[0015] The semiconductor laser of the another side pickup 3, and the example of a configuration of optical system and the example of a configuration of tracking error signal detection of a digital disposal circuit 7 are shown in drawing 5 . In drawing 5 , the same sign as drawing 3 is the same part. In drawing 5 , the part for generation of a tracking error signal is described in the detail. drawing 5 -- setting -- 1 -- a disk and 26 -- an objective lens and 27 -- half prism and 28 -- semiconductor laser and 29 -- a photodetector and 31 -- for the error computing element for tracking error signal generation, and 34, as for sublaser and 37, the Maine laser, and 35 and 36 are [a diffraction grating, and 32a and 32b / the photodetector for tracking error signal generation, and 33 / a pit (part with information) and 38] lands (mirror plane of an optical disk). Incidence is carried out to a diffraction grating 31, pass, and the flux of light which semiconductor laser 28 emits passes the half prism 26, has focused with an objective lens 26, and connects the beam spot on a disk 1. At this time, before and behind the Maine laser spot 34 for focal error signal generation mentioned above, the sublaser spots 35 and 36 for tracking error signal generation are slightly shifted right and left by the diffraction grating 31, and are arranged. The laser reflected light from a disk 1 passes along an objective lens 26 as well as the Maine laser 34, and it is reflected by the half prism 27, and in the Maine laser 34, a spot is connected to a photodetector 29 and an epilogue and the sublaser 35 and 36 connect a spot to Photodetectors 32a and 32b, respectively. In a photodetector 29, as mentioned above, a focal error signal is generated. Generation of a tracking error signal is explained here using drawing 6 .

[0016] In drawing 6 , the same sign as drawing 5 shows the same part. Generally, with an optical disk, if laser is irradiated at the pit 37 section, the amount of reflected lights will decrease according to the diffraction effect of the reflected light from the pit 37 section and the land 38 section, if laser is irradiated conversely at a land, it will reflect altogether and the amount of reflected lights will become large. The condition from which, as for A, the location of an objective lens 26 shifted on the left of the pit top on the pit, the condition which tracking suits B and is right above, and C show the Maine laser spot 34 in the condition of having shifted on the right of the pit top, and the subbeam spots 35 and 36, respectively. While the Maine spot 34 is tracing the pit 32 top correctly like B, the amount of reflected lights of two subspots 35 and 36 becomes equal, but when it shifts to the left like A, the subspot 36 goes into between [38] a pit 37 and pits 37 (i.e., a land), and the amount of reflected lights becomes large. Since one subspot 35 grazes a pit top, the amount of reflected lights becomes small.

[0017] Moreover, when it shifts to the right like C, the subspot 35 goes into between [38] a pit 37 and pits 37 (i.e., a land), and the amount of reflected lights becomes large. Since one subspot 36 grazes a pit 37 top, the amount of reflected lights becomes small. Thus, if these two outputs are calculated with the error amplifier 33 using the magnitude of the amount of reflected lights of the beam spot which carries out incidence to Photodetectors 32a and 32b differing, the tracking error signal of positive/negative as shown in the amount of truck gaps and drawing 6 according to the polarity shifted of a direction will be acquired. (The so-called 3 beam detecting method) In drawing 6 , an axis of abscissa is a tracking gap of an objective lens, and an axis of ordinate is signal level. It has the description to which an objective lens 26 carries out the zero cross of the serpentine curve of a tracking error signal at the point on a pit 37. in addition, the polarity of this serpentine curve -- the difference in the input to the error computing element 29 -- although it can become reverse, it cannot be overemphasized that it should just have reverse a view of the direction of signal level and a tracking gap in the case of such a system. Moreover,

it does not pass over the example of generation of this tracking error signal to an example, and if the tracking error signal in this invention is a signal with a polarity as shown in drawing 6 , that generation means will not be asked.

[0018] The tracking error signal generated with said error computing element 33 is supplied to the tracking control circuit 9, and generates and outputs the tracking driving signal of the objective lens 26 which performs feedback control near [in the serpentine curve of a tracking error signal] a zero cross point in this tracking control circuit 9. This output signal is supplied to a circuit changing switch 21. It has switched to the stationary side (A side) by the command of a microcomputer 13 at the time of a stationary, and this circuit changing switch 21 is supplied as a tracking driving signal of an objective lens 26. An objective lens 26 is horizontally controlled by this tracking driving signal from a periphery or a periphery from inner circumference in the direction of inner circumference to a disk, and the condition of realizing tracking control of the feedback loop and being always on the pit 37 in the recording surface of a disk 1 is maintained.

[0019] Moreover, the driving signal outputted from this tracking control circuit 9 is supplied also to the thread control circuit 10, it generates the driving signal which controls the thread motor 6 according to a gap in the direction of tracking of an objective lens 26 in this thread control circuit 10, supplies this to the thread motor 5, operates the thread motor 5, and moves the pickup 3 whole. Moreover, in a digital disposal circuit 7, the signal which supplies the rotation period information read in the disk 1 to the spindle control circuit 11, and drives a spindle motor 6 in the spindle control circuit 11 based on this rotation period information is generated, and a spindle motor 6 is supplied. It is in the condition by which the above is on a focusing point at the time of a stationary, and a focus, tracking, the spindle, and the thread were controlled.

[0020] Here, as the disk 1 mentioned above, in the case of a disk, a focusing point location may have to be switched to the layer of another recording surface more than two-layer [of DVD / single-sided] from the layer of the recording surface which is now. For example, the location of an objective lens 26 is on the focusing point of the recording surface of a 0 horizon, and the case where a focusing point is jumped in the upper layer (one layer) from a lower layer (0 horizon) is explained [that is,] to bring a focusing point to the recording surface whose number is further one. The focal driving signal outputted from the focal control circuit 8 in the condition of being on the focusing point of the recording surface of a 0 horizon by the steady state first until now is supplied to ON/OFF switch 20a, in the case of the steady state, it has switched to the A side (ON), and it is supplied to before value holding circuit 22a as it is.

[0021] In this last value holding circuit 22a, that value is always held until a value changes, and this held value is supplied to LPF14. In this LPF14, although the high-frequency component (noise component) of the signal which drives an objective lens 26 in the direction of a focus is removed, a low-pass component like face deflection has the frequency band which is not removed, mainly removes a noise component, and it supplies it to an adder circuit 17. Actuation to LPF14 is always performed at the time of a stationary. In case it moves to the focusing point of the recording surface of one layer here, a microcomputer 13 switches ON/OFF switch 20a for circuit-changing-switch 19a to the B side (off) the B side. Since ON/OFF switch 20a becomes open, the feedback loop which was controlling the objective lens 26 of the direction of a focus until now turns into open-loop, and control is cut. Since it goes up to the recording surface of one layer, a microcomputer 13 sets up the rise electrical-potential-difference value 15 and the downward electrical-potential-difference value 16 of constant value. Moreover, a microcomputer 13 issues directions so that the electrical-potential-difference change-over switch 18 may be switched to a rise electrical-potential-difference value side. Besides, the output from the rising voltage value 15 is supplied to an adder circuit 17. The signal and rise electrical-potential-difference value which removed the high region noise component are added and outputted by said LPF14 in an adder circuit 17, and circuit-changing-switch 19a is supplied. Since the switch has switched to the B side, said addition signal supplied to circuit-changing-switch 19a passes circuit-changing-switch 19a, supplies it to pickup 3, and raises an objective lens 26 in the direction of a focus.

[0022] An objective lens 26 begins a rise by the driver voltage to which the rise electrical-potential-difference value was added. The focal error signal outputted from the digital disposal circuit 7 here is

supplied to the focal zero cross detector 12, the point that a focal error signal crosses zero (core) in this focal zero cross detector 12 is detected, and a microcomputer 13 is supplied. If the point which carries out a zero cross again is detected, the downward electrical-potential-difference value 16 will be set up, and directions will be taken out with a microcomputer 13 so that the electrical-potential-difference change-over switch 18 may be switched to a downward electrical-potential-difference value. At this time, the time amount (time amount A) which impressed the rise electrical-potential-difference value is measured with the microcomputer 13. The output from this downward electrical-potential-difference value 16 is supplied to an adder circuit 17. The signal and downward electrical-potential-difference value which removed the high-frequency component are added and outputted by said LPF14 in an adder circuit 17. Since it was the midst which is carrying out the layer jump, circuit-changing-switch 19a has switched to the B side. Said addition signal supplied to circuit-changing-switch 19a passes circuit-changing-switch 19a, supplies it to pickup 3, and drops an objective lens in the direction of a focus shortly. Impression of this descent electrical-potential-difference value will impress the electrical potential difference of hard flow to the objective lens 26 which was going up till then, and serves to stop a rise of an objective lens 26 as a brake. After impressing a fixed time amount downward electrical-potential-difference value of the multiple time amount (time-amount AxK K: constant) of the time amount which impressed the rise electrical-potential-difference value, in order to double a focusing point with the recording surface of one layer, a microcomputer 13 switches ON/OFF switch 20a for circuit-changing-switch 19a to the A side (ON) the A side. The focal control which had become open-loop turns into control by the feedback loop using a focal error signal again by this, and it controls to draw in the focusing point of the recording surface of one layer. It will be in the condition of being in the focusing point of one layer from the condition which is in the focusing point of the recording surface of a 0 horizon by the above-mentioned actuation.

[0023] On the other hand, the tracking control at this time is explained. The tracking driving signal of the objective lens 26 outputted from the tracking control circuit 9 in the condition of being on the pit of the recording surface of a 0 horizon by the steady state first until now is supplied to ON/OFF switch 20b, in the case of the steady state, it has switched to the A side, and it is supplied to before value holding circuit 22b as it is.

[0024] In this last value holding circuit 22b, that value is always held until a value changes, and this held value is supplied to a circuit changing switch 21. Actuation to this last value holding circuit 22b is always performed at the time of a stationary. In case a layer jump is performed, a microcomputer 13 switches ON/OFF switch 20b for a circuit changing switch 21 to the B side (off) the C side. Since ON/OFF switch 20b becomes open, the feedback loop of the tracking control which was controlling the objective lens 26 of the direction of tracking until now turns into open-loop, and control is cut. However, since the horizontal driving signal of an objective lens 26 holds the value before the feedback loop is cut by last value holding circuit 22b, the value of the tracking driving signal of an objective lens 26 does not change during a layer jump, and the location of the direction of tracking of an objective lens 26 is fixed, and is not moved. In order to double with a focusing point at the recording surface of the layer which carried out the layer jump, when a microcomputer 13 switches focal control to control by the feedback loop, a microcomputer 13 switches a circuit changing switch 21 to the B side. At this time, circuit-changing-switch 19b outputs the output zero signal which outputs the tracking driving signal of the objective lens 25 generated in the tracking control circuit 9, and closes the feedback loop with the signal generated by the COUT generation circuit 25, or (A side) is outputted from the drive output middle point circuit 23, and carries out it at the output middle point, or (B side) is switched. By controlling the output of a tracking driving signal using this COUT signal, an objective lens 26 can move in the direction of tracking produced by layer jump unnecessarily, and thing control can be carried out. After a layer jump, the circuit changing switch 21 is made into the B side, the A side, it makes ON/OFF switch 20b the A side, makes a circuit changing switch 21 feedback loop control completely, and performs stationary control in the place by which **** of tracking was settled and stabilized for the time being.

[0025] Here, the tracking driving signal to the objective lens 26 for controlling migration of an objective

lens 26 in the unnecessary direction of tracking produced after the signal made in the COUT generation circuit 25 and a layer jump is explained using drawing 7 . A signal (mirror signal) with the objective lens 25 needed for which [on a pit 37 and a land 38] generated by the digital disposal circuit 7 and the TZC (truck zero cross) signal generated in the TZC signal generation circuit 24 are supplied to the COUT generation circuit 25. The tracking error signal mentioned above is supplied to this TZC signal generation circuit 24, and it changes into the TZC signal made binary bordering on the zero cross (core) of this tracking error signal. It is used as a signal which shows the direction of in the which direction of the direction of tracking the signal or objective lens 26 in which it is shown in which location on a pit the objective lens 26 of this TZC signal is is moved.

[0026] The case where an objective lens 26 crosses a pit in the direction of tracking in the direction of a periphery, and moves [of a disk 1] to it from inner circumference after layer jump termination first in drawing 7 (a) to it is explained. As shown in drawing 6 , a tracking error signal is near a zero cross, when the main beam 34 is tracing the top on a pit, but an error signal is produced as it shifts from on a pit. When in the case of drawing 6 it becomes the signal with which signal level is subtracted, and it appears so that it may be made to move to the right when a main beam 34 shifts to the left like A, and a main beam 34 shifts to the right like C, it is as having mentioned above for signal level to be added and to appear so that it may be made to move to the left. If the locus of the direction of tracking of an objective lens 26 crosses the part (a land 38, a mirror plane, or mirror side) which does not have a pit 37 a pit 37 top, a tracking error signal will output the signal which is going to return on a pit. In (a) of drawing 7 , to an objective lens 26, when a tracking error signal is a forward value, the force which is going to move to inner circumference from a periphery works, and when it is a negative value, the force which is going to move to a periphery from inner circumference works. When it is on a pit and a signal (mirror signal) needed for which [on a pit 37 and a land 38] at this time is on LOW and a mirror plane, it is outputted by HIGH. The signal which shows the direction of in the which direction of the direction of tracking an objective lens 26 is moved is a TZC (truck zero cross) signal, and HIGH is outputted, when it is going to move from a periphery to inner circumference in this case when a tracking error signal is a forward value that is, and is going to move to a periphery at LOW and the time of a negative value, i.e., inner circumference. This signal is generated in the TZC generation circuit 24.

[0027] A COUT signal is a signal which latched the mirror signal mentioned above in the standup of a TZC signal, or falling. After a layer jump, this COUT signal serves as LOW at the period which a tracking driving signal tends to commit in the direction (from a periphery to inner circumference) contrary to the migration direction of an objective lens 26, when an objective lens 26 moves to a periphery from inner circumference. The tracking driving signal of this period works as a brake which is going to move in the direction contrary to the direction to which an objective lens 26 moves. Moreover, a tracking driving signal serves as HIGH at the period which it is going to commit in the same direction (from inner circumference to a periphery) as the migration direction of an objective lens 26. Then, this HIGH period intercepts the tracking driving signal acquired from a tracking error signal, and carries out an output at the middle point, and if it is made to output a tracking driving signal, a LOW period can give only the force committed from a periphery to inner circumference to the objective lens 26 which is moving to the periphery from inner circumference, and will serve to stop a motion of an objective lens 25.

[0028] Conversely, the case where an objective lens 26 crosses and moves [of a disk 1] a pit in the direction of tracking in the direction of inner circumference from a periphery after layer jump termination in drawing 7 (b) is explained. If the locus of the objective lens 26 of the direction of tracking crosses the part (a land 38, a mirror plane, or mirror side) which does not have a pit 37 a pit 37 top, a tracking error signal will output the signal which is going to return on a pit. In (b) of drawing 7 , to an objective lens 26, when a tracking error signal is a forward value, the force which is going to move to inner circumference from a periphery works, and when it is a negative value, the force which is going to move to a periphery from inner circumference works. When it is on a pit 37 and a signal (mirror signal) needed for which [on a pit 37 and a land 38] at this time is on LOW and a land 38, it is outputted by HIGH. When it tends to move from a periphery to inner circumference in this case when the signal

which shows the direction of in the which direction of the direction of tracking an objective lens 26 is moved is a value forward in a tracking error signal that is, and it tends to move to a periphery at ** LOW and the time of a negative value, i.e., inner circumference, by the TZC (truck zero cross) signal, it outputs HIGH. A COUT signal is a signal which latched the mirror signal mentioned above in the standup of a TZC signal, or falling. After a layer jump, this COUT signal serves as LOW at the period which a tracking driving signal tends to commit in the direction (from inner circumference to a periphery) contrary to the migration direction of an objective lens 26, when an objective lens 26 moves to inner circumference from a periphery. The tracking driving signal of this period works as a brake which is going to move in the direction contrary to the direction to which an objective lens 26 moves. Moreover, a tracking driving signal serves as HIGH at the period which it is going to commit in the same direction (from a periphery to inner circumference) as the migration direction of an objective lens 26. Then, this HIGH period intercepts the tracking driving signal acquired from a tracking error signal, and carries out an output at the middle point, and if it is made to output a tracking driving signal, a LOW period can give only the force committed from inner circumference to a periphery to the objective lens 26 which is moving to inner circumference from the periphery, and will serve to stop a motion of an objective lens 25. When this COUT signal was used and a layer jump is carried out, according to the force applied in the direction of tracking, the motion which an objective lens 25 tends to move can be controlled and tracking can be drawn quickly.

[0029] This condition is explained using drawing 8 . At the time of a rise, drawing 8 (b) shows the focal error signal at the time of descent, and a focal driving signal, the polarity of switches 19a, 20a, and 21 and a tracking driving signal, an axis of abscissa is time amount and the axis of ordinate of drawing 8 (a) is an electrical-potential-difference value. In this case, if an objective lens 26 raises a focal driver voltage value, an objective lens 26 will also go up, and if a focal driver voltage value is lowered, an objective lens 26 shall descend. The focal error signal of the condition that drawing 8 (a) is in a focusing point by the recording surface of a lower layer (0 horizon) by the case where the location of a focusing point is raised from a 0 horizon to one layer is near the zero mostly. The focal driving signal has also required control of the feedback loop, and it becomes fixed with a certain electrical-potential-difference value. If circuit changing switches 19a and 20a are made into a jump side (B side) from a stationary side (A side) here, control of the feedback loop will go out and a fixed rise electrical potential difference will be impressed to coincidence in the direction of a focus. Moreover, a switch 21 is switched to coincidence from a stationary side (A side) to a jump side (C side). Then, since an objective lens 26 begins a rise in the direction of a focus, the focusing point in a 0 horizon separates from it, it goes, and a focal error signal goes down a trough. The trough of the lever which furthermore continues a rise is crossed. The objective lens 26 of the direction of tracking at this time holds the value of a tracking driving signal just before beginning a layer jump, and the location of the objective lens 26 of the direction of tracking is standing it still in the fixed location. If it furthermore continues applying a rise electrical potential difference in the direction of a focus, a focal error signal will go up a trough and a zero crossing point will appear. Although the point which crosses the zero (core) of a focal error signal with the focal zero cross detector 12 at this time is detected, the location of this core is detected with a hysteresis. That is, let the location which shifted from the core be a zero crossing point.

[0030] In this zero crossing point, a rise electrical potential difference is switched to a downward electrical potential difference. The time amount (time amount A) which besides impressed rising voltage is measured with a microcomputer 13. Although the acceleration of the objective lens 26 produced with the rise electrical potential difference by the fixed downward electrical potential difference consists of a rise in the downward direction, an objective lens 26 continues a rise and begins stop descent soon for the time being. It stops impressing a downward-after multiple time amount (time amount AxK K being constant) of time amount which impressed rise electrical potential difference electrical potential difference, and circuit-changing-switch 19a and ON/OFF switch 20a are switched to a stationary side (A side). Control of another side tracking switches a circuit changing switch 21 to the Inn side (B side). Since an objective lens 26 is near the point focusing [of the 1st layer] at this time, focal control of the feedback loop by the focal error signal is performed, and it draws in the focusing point of the recording

surface of the 1st layer. The another side objective lens 26 tends to move in the direction which received the force in order to receive the force also in the direction of tracking by layer jump. Therefore, the motion which is going to move is controlled by control of the tracking driving signal using the COUT signal mentioned above. A fixed period circuit changing switch 21 is made into the Inn side (B side), a motion of the objective lens 26 of the direction of tracking is lost, if it will be in the condition that tracking drew on a certain pit 37, a circuit changing switch 21 will be made into a stationary side (A side), and tracking control of the feedback loop by the tracking error signal is performed.

[0031] The focal error signal of the condition that drawing 8 (a) is in a focusing point by the recording surface of the upper layer (one layer) by the case where the location of a focusing point is raised from one layer to a 0 horizon is near the zero mostly similarly. The focal driving signal has also required control of the feedback loop, and it becomes fixed with a certain electrical-potential-difference value. If circuit changing switches 19a and 20a are made into a jump side (B side) from a stationary side (A side) here, control of the feedback loop will go out and a fixed descent electrical potential difference will be impressed to coincidence in the direction of a focus. Moreover, a switch 21 is switched to coincidence from a stationary side (A side) to a jump side (C side). Then, since an objective lens 26 begins descent in the direction of a focus, the focusing point in one layer separates from it, it goes, and a focal error signal goes up a crest. The crest of the lever which furthermore continues descent is crossed. The objective lens 26 of the direction of tracking at this time holds the value of a tracking driving signal just before beginning a layer jump, and the location of the objective lens 26 of the direction of tracking is standing it still in the fixed location. If it furthermore continues applying a downward electrical potential difference in the direction of a focus, a focal error signal will get down from a crest, and a zero crossing point will appear. Although the point which crosses the zero (core) of a focal error signal with the focal zero cross detector 12 at this time is detected, the location of this core is detected with a hysteresis. That is, let the location which shifted from the core be a zero crossing point. In this zero crossing point, a downward electrical potential difference is switched to a rise electrical potential difference. The time amount (time amount A) which impressed this downward electrical potential difference is measured with a microcomputer 13. Although the acceleration of the objective lens 26 produced with the downward electrical potential difference by the fixed rise electrical potential difference consists of descent in the rise direction, an objective lens 26 continues descent and begins a stop rise soon for the time being. It stops impressing a rise-after multiple time amount (time amount AxK K being constant) of time amount which impressed downward electrical potential difference electrical potential difference, and circuit-changing-switch 19a and ON/OFF switch 20a are switched to a stationary side (A side). Control of another side tracking switches a circuit changing switch 21 to the Inn side (B side). Since an objective lens 26 is near the focusing point of a 0 horizon eye at this time, focal control of the feedback loop by the focal error signal is performed, and it draws in the focusing point of the recording surface of a 0 horizon eye. The another side objective lens 26 tends to move in the direction which received the force in order to receive the force also in the direction of tracking by layer jump. Therefore, the motion which is going to move is controlled by control of the tracking driving signal using the COUT signal mentioned above. A fixed period circuit changing switch 21 is made into the Inn side (B side), a motion of the objective lens 26 of the direction of tracking is lost, if it will be in the condition that tracking drew on a certain pit 37, a circuit changing switch 21 will be made into a stationary side (A side), and tracking control of the feedback loop by the tracking error signal is performed.

[0032] In addition, although how depending on which the crest of the above-mentioned focal error signal and a trough appear may completely become reverse with the polarity of the error computing element 25 as mentioned above, it cannot be overemphasized that what is necessary is just to think that appear in that case and the direction becomes reverse.

[0033] Although a microcomputer 13 performs each control at the time of the above layer jump, the PAD diagram of the algorithm of the control in that case is shown in drawing 9 . A layer jump can control by the microcomputer 13 to stability with this algorithm, drawing in of the tracking after a layer jump becomes early, and reading of data becomes early.

[0034] As explained above, in case a layer jump is performed according to this example, can impress

always proper acceleration voltage also to a noise also to field blurring, and it is making. A rise electrical potential difference required to move to other layers or a downward electrical potential difference is controlled by a layer switching and detecting a point appropriately, and a layer jump can be performed stably. And it can control that an objective lens moves in the direction of tracking by intercepting the unnecessary tracking driving signal after jumping, and drawing in of tracking control can be carried out early. The optical disk unit which carries out reading of the data from the optical disk after a layer jump early and which can carry out things is realizable.

[0035] Drawing 10 is the block diagram showing other examples of this invention. The same number is given to the element same in the example of drawing 1 . Differing from the example of drawing 1 is a point which is not the TZC signal made binary by the zero cross (core) of the tracking error signal which the TZC signal generated in the TZC generation circuit 24 supplied to the COUT generation circuit 25 mentioned above but the TZC signal made binary by the zero cross of the tracking driving signal which processed and generated this tracking error signal in the tracking control circuit 9. Hereafter, an outline of operation is explained. As actuation, it is the same as that of the first example, and in case an objective lens 26 is moved to the focusing point of other layers from the layer which is already in a focusing point, a layer jump is performed, as a rise electrical potential difference and a downward electrical potential difference are added to the focal driving signal which removed the noise component, the layer of a recording surface switches and a rise electrical potential difference and a downward electrical potential difference are switched at a point. In case an another side tracking driving signal performs a layer jump, a microcomputer 13 switches ON/OFF switch 20b for a circuit changing switch 21 to the B side (off) the C side. Since ON/OFF switch 20b becomes open, the feedback loop of the tracking control which was controlling the objective lens 26 of the direction of tracking until now turns into open-loop, and control is cut. However, since the horizontal driving signal of an objective lens 26 holds the value before the feedback loop is cut by last value holding circuit 22b, the value of the tracking driving signal of an objective lens 26 does not change during a layer jump, and the location of the direction of tracking of an objective lens 26 is fixed, and is not moved. In order to double with a focusing point at the recording surface of the layer which carried out the layer jump, when a microcomputer 13 switches focal control to control by the feedback loop, a microcomputer 13 switches a circuit changing switch 21 to the B side. At this time, circuit-changing-switch 19b outputs the output zero signal which outputs the tracking driving signal of the objective lens 25 generated in the tracking control circuit 9, and closes the feedback loop with the signal generated by the COUT generation circuit 25, or (A side) is outputted from the output middle point setting circuit 23, and carries out it at the output middle point, or (B side) is switched. By controlling the output of a tracking driving signal using this COUT signal, an objective lens 26 can move in the direction of tracking produced by layer jump unnecessarily, and thing control can be carried out. After a layer jump, the circuit changing switch 21 is made into the B side, the A side, it makes ON/OFF switch 20b the A side, makes a circuit changing switch 21 feedback loop control completely, and performs stationary control in the place by which **** of tracking was settled and stabilized for the time being.

[0036] the objective lens 25 generated by the digital disposal circuit 7 needs for which [on a pit 37 and a land 38] the signal made in the COUT generation circuit 25 at this time -- it is the signal which started, or fell, came out and latched that signal (mirror signal) and the TZC (truck zero cross) signal generated in the TZC signal generation circuit 24. The tracking driving signal which processed and generated this tracking error signal in the tracking control circuit 9 is supplied to this TZC signal generation circuit 24, and it changes into the TZC signal made binary bordering on the zero cross (core) of this tracking driving signal. It is used as a signal which shows the direction of in the which direction of the direction of tracking the signal or objective lens 26 in which it is shown in which location on a pit the objective lens 26 of this TZC signal is is moved.

[0037] The difference in the TZC signal in the first example is explained here using drawing 11 and drawing 12 . As shown in drawing 11 , this tracking error signal is supplied to the tracking control circuit 9, a tracking driving signal is generated, but in order for this tracking control circuit 9 to constitute the feedback loop in order to put an objective lens 26 on the pit of a disk recording surface,

and to make a control system stability, constituting from a phase compensator is common. Drawing 12 is the case where delay has arisen in the phase between a tracking error signal and a tracking driving signal as a property of the compensator of the tracking control circuit 9, and an objective lens 26 crosses a pit in the direction of tracking in the direction of a periphery, and moves [of a disk 1] to it from inner circumference after layer jump termination like drawing 7 (a) to it. A tracking error signal, a mirror signal, a TZC signal ((a) is generated from a tracking error signal.) (b) shows the tracking driving signal from switch 19b controlled by generation, the COUT signal, the tracking driving signal generated in the tracking control circuit 9, and the COUT signal from the tracking driving signal. An axis of abscissa expresses time amount and an axis of ordinate expresses an electrical potential difference. In drawing 12 R> 2 (a), it is generating from the tracking error signal like a configuration of that drawing 1 shows a TZC signal. when falling of this TZC signal or the COUT signal which started, came out and latched the mirror signal is HIGH, an output is intercepted, the middle point is outputted, and in LOW, when it is made to output the output from the tracking control circuit 9, from switch 19b of drawing 1 , the tracking driving signal of the direction which wants to intercept an output originally for phase lag will also be outputted. On the other hand, it generates from a tracking driving signal like a configuration of that drawing 10 shows a TZC signal like drawing 12 (b). in LOW, by intercepting an output, when falling of this TZC signal or the COUT signal which started, came out and latched the mirror signal is HIGH, and outputting the middle point, when it is made to output the output from the tracking control circuit 9 From switch 19b of drawing 10 , only the tracking driving signal of the direction which wants to intercept an output can intercept an output.

[0038] When, using the frequency which advances or delays a phase as a property of the compensator of a control system in short, a configuration like drawing 10 R> 0 is desirable, but when a phase does not change, a problem does not have the configuration of drawing 1 , either.

[0039] As explained above, in case a layer jump is performed according to this example, can impress always proper acceleration voltage also to a noise also to field blurring, and it is making. A rise electrical potential difference required to move to other layers or a downward electrical potential difference is controlled by a layer switching and detecting a point appropriately, and a layer jump can be performed stably. And it can control that an objective lens moves in the direction of tracking by intercepting the phase of a control system in consideration of the unnecessary tracking driving signal after jumping, and drawing in of tracking control can be carried out early. The optical disk unit which carries out reading of the data from the optical disk after a layer jump early and which can carry out things is realizable.

[0040] Drawing 13 is the block diagram showing other examples of this invention. The same number is given to the same element as the thing in the example of drawing 10 . Differing from the example of drawing 10 is the point that the output middle point setting circuit 23 is the input inverter circuit 39. Hereafter, an outline of operation is explained. In case an objective lens 26 is moved to the focusing point of other layers as actuation from the layer which is the same as that of the first and the second example, and is already in a focusing point, a layer jump is performed, as a rise electrical potential difference and a downward electrical potential difference are added to the focal driving signal which removed the noise component, the layer of a recording surface switches and a rise electrical potential difference and a downward electrical potential difference are switched at a point. In case an another side tracking driving signal performs a layer jump, a microcomputer 13 switches ON/OFF switch 20b for a circuit changing switch 21 to the B side (off) the C side. Since ON/OFF switch 20b becomes open, the feedback loop of the tracking control which was controlling the objective lens 26 of the direction of tracking until now turns into open-loop, and control is cut. However, since the horizontal driving signal of an objective lens 26 holds the value before the feedback loop is cut by last value holding circuit 22b, the value of the tracking driving signal of an objective lens 26 does not change during a layer jump, and the location of the direction of tracking of an objective lens 26 is fixed, and is not moved. In order to double with a focusing point at the recording surface of the layer which carried out the layer jump, when a microcomputer 13 switches focal control to control by the feedback loop, a microcomputer 13 switches a circuit changing switch 21 to the B side. At this time, circuit-changing-switch 19b is made

into the signal outputted from the input inverter circuit 39 made into the signal which outputted the tracking driving signal of the objective lens 25 generated by the signal generated by the COUT generation circuit 25 in the tracking control circuit 9 as it was, or (A side) reversed this tracking driving signal, or (B side) is switched. By controlling the output of a tracking driving signal using this COUT signal, an objective lens 26 can move in the direction of tracking produced by layer jump unnecessarily, and thing control can be carried out. After a layer jump, the circuit changing switch 21 is made into the B side, the A side, it makes ON/OFF switch 20b the A side, makes a circuit changing switch 21 feedback loop control completely, and performs stationary control in the place by which **** of tracking was settled and stabilized for the time being.

[0041] When controlling a tracking driving signal by the second example for a start using this COUT signal after layer jump termination, it is made to output only the tracking driving signal which works so that migration in the direction of tracking produced by layer jump may be controlled, and he intercepts the tracking driving signal which works so that migration may be promoted, and was trying not to output it. If a polarity is reversed, the tracking driving signal which works so that this migration may be promoted will come to work so that migration may be controlled conversely. If it is reversed in the input inverter circuit 39 and the signal outputted from the tracking control circuit 9 in this example is supplied to this circuit-changing-switch 19b using this, the output of circuit-changing-switch 19b by this COUT signal will serve as a signal which controls migration in the direction of tracking always produced by layer jump. Even if it transposes the middle point setting circuit 23 of the first example to the input inverter circuit 39, it operates similarly.

[0042] As explained above, in case a layer jump is performed according to this example, can impress always proper acceleration voltage also to a noise also to field blurring, and it is making. A rise electrical potential difference required to move to other layers or a downward electrical potential difference is controlled by a layer switching and detecting a point appropriately, and a layer jump can be performed stably. And drawing in of tracking control can be early carried out with outputting only the signal which controls that an objective lens also always moves the phase of a control system in the direction of tracking unnecessarily in consideration of the tracking driving signal after jumping. The optical disk unit which carries out reading of the data from the optical disk after a layer jump early and which can carry out things is realizable.

[0043] Drawing 14 is the block diagram showing other examples of this invention. The same number is given to the element same in the example of drawing 1 . 19c is a circuit changing switch. Differing from the example of drawing 1 R> 1 are the point which has arranged in the preceding paragraph what had the location of circuit-changing-switch 19b in the latter part of the tracking control circuit 9, and a point which has arranged circuit-changing-switch 19c.

[0044] Hereafter, an outline of operation is explained. As actuation, it is the same as that of the first example, and in case an objective lens 26 is moved to the focusing point of other layers from the layer which is already in a focusing point, a layer jump is performed, as a rise electrical potential difference and a downward electrical potential difference are added to the focal driving signal which removed the noise component, the layer of a recording surface switches and a rise electrical potential difference and a downward electrical potential difference are switched at a point. In case an another side tracking driving signal performs a layer jump, a microcomputer 13 switches ON/OFF switch 20b for a circuit changing switch 21 to the B side (off) the C side. Circuit-changing-switch 19c is on the A side. Since ON/OFF switch 20b becomes open, the feedback loop of the tracking control which was controlling the objective lens 26 of the direction of tracking until now turns into open-loop, and control is cut. However, since the horizontal driving signal of an objective lens 26 holds the value before the feedback loop is cut by last value holding circuit 22b, the value of the tracking driving signal of an objective lens 26 does not change during a layer jump, and the location of the direction of tracking of an objective lens 26 is fixed, and is not moved. In order to double with a focusing point at the recording surface of the layer which carried out the layer jump, when a microcomputer 13 switches focal control to control by the feedback loop, a microcomputer 13 switches a circuit changing switch 21 to the A side, and switches circuit-changing-switch 19c to the B side. At this time, circuit-changing-switch 19b outputs the zero signal

which outputs the tracking error signal generated by the digital disposal circuit 7, and closes the feedback loop with the signal generated by the COUT generation circuit 25, or (A side) is outputted from the output middle point setting circuit 23, and carries out it at the output middle point, or (B side) is switched. By controlling the output of a tracking error signal using this COUT signal, an objective lens 26 can move in the direction of tracking produced by layer jump unnecessarily, and thing control can be carried out. After a layer jump, circuit-changing-switch 19c is made into the B side, the A side, it makes ON/OFF switch 20b the A side, makes circuit-changing-switch 19c feedback loop control completely, and performs stationary control in the place by which **** of tracking was settled and stabilized for the time being.

[0045] In order to constitute the feedback loop in order that this tracking control circuit 9 may put an objective lens 26 on the pit of a disk recording surface as mentioned above, and to make a control system stability, constituting from a phase compensator is common. Drawing 15 shows the tracking driving signal generated in the tracking error signal and the tracking control circuit 9 from switch 19b which were controlled by the tracking error signal acquired in the example of drawing 14 , the mirror signal, the TZC signal (from a tracking error signal to generation), the COUT signal, and the COUT signal. An axis of abscissa expresses time amount and an axis of ordinate expresses an electrical potential difference. In this case, delay has arisen in the phase between a tracking error signal and a tracking driving signal as a property of the compensator of the tracking control circuit 9 in the case where an objective lens 26 crosses a pit in the direction of tracking in the direction of a periphery, and moves [of a disk 1] to it from inner circumference after layer jump termination like drawing 7 (a) to it. in drawing 15 (a), if intercept the tracking error signal output of circuit-changing-switch 19b, the middle point is outputted, a tracking error signal is outputted in LOW and the tracking control circuit 9 is supplied when falling of a TZC signal or the COUT signal which started, came out and latched the mirror signal is HIGH, the tracking driving signal with which the phase was in the output from this tracking control circuit 9 to the tracking error signal will be outputted. Although the delay of a phase is between a tracking error signal and a tracking driving signal, only the tracking driving signal of the direction which wants to intercept an output can be intercepted.

[0046] As explained above, in case a layer jump is performed according to this example, can impress always proper acceleration voltage also to a noise also to field blurring, and it is making. A rise electrical potential difference required to move to other layers or a downward electrical potential difference is controlled by a layer switching and detecting a point appropriately, and a layer jump can be performed stably. And it can control that an objective lens moves in the direction of tracking by intercepting the unnecessary tracking error signal after jumping, and drawing in of tracking control can be carried out early. The optical disk unit which carries out reading of the data from the optical disk after a layer jump early and which can carry out things is realizable.

[0047] Drawing 16 is the block diagram showing other examples of this invention. The same number is given to the element same in the example of drawing 1 . 19c is a circuit changing switch and 39 is an input inverter circuit. Differing from the example of drawing 1 are the point which has arranged in the preceding paragraph what had the location of circuit-changing-switch 19b in the latter part of the tracking control circuit 9, the point which has arranged circuit-changing-switch 19c, and the point that the output middle point setting circuit 23 is the input inverter circuit 39. Hereafter, an outline of operation is explained. As actuation, it is the same as that of the first example, and in case an objective lens 26 is moved to the focusing point of other layers from the layer which is already in a focusing point, a layer jump is performed, as a rise electrical potential difference and a downward electrical potential difference are added to the focal driving signal which removed the noise component, the layer of a recording surface switches and a rise electrical potential difference and a downward electrical potential difference are switched at a point.

[0048] In case an another side tracking driving signal performs a layer jump, a microcomputer 13 switches ON/OFF switch 20b for a circuit changing switch 21 to the B side (off) the C side. Circuit-changing-switch 19c is on the A side. Since ON/OFF switch 20b becomes open, the feedback loop of the tracking control which was controlling the objective lens 26 of the direction of tracking until now

turns into open-loop, and control is cut. However, since the horizontal driving signal of an objective lens 26 holds the value before the feedback loop is cut by last value holding circuit 22b, the value of the tracking driving signal of an objective lens 26 does not change during a layer jump, and the location of the direction of tracking of an objective lens 26 is fixed, and is not moved. In order to double with a focusing point at the recording surface of the layer which carried out the layer jump, when a microcomputer 13 switches focal control to control by the feedback loop, a microcomputer 13 switches a circuit changing switch 21 to the A side, and switches circuit-changing-switch 19c to the B side. It is made the signal outputted from the input inverter circuit 39 made into the signal which outputted the tracking error signal generated by the digital disposal circuit 7, and closed the feedback loop with the signal with which circuit-changing-switch 19b is generated by the COUT generation circuit 25 at this time, or (A side) reversed this tracking error signal, or (B side) switches. It can control that an objective lens 26 moves in the direction of tracking produced by layer jump unnecessarily by controlling the output of a tracking error signal using this COUT signal. After a layer jump, circuit-changing-switch 19c is made into the B side, the A side, it makes ON/OFF switch 20b the A side, makes circuit-changing-switch 19c feedback loop control completely, and performs stationary control in the place by which **** of tracking was settled and stabilized for the time being.

[0049] In order to constitute the feedback loop in order that this tracking control circuit 9 may put an objective lens 26 on the pit of a disk recording surface as mentioned above, and to make a control system stability, constituting from a phase compensator is common. Drawing 15 (b) shows the tracking driving signal generated in the tracking error signal and the tracking control circuit 9 from switch 19b which were controlled by the tracking error signal acquired in the example of drawing 16 , the mirror signal, the TZC signal (from a tracking error signal to generation), the COUT signal, and the COUT signal. An axis of abscissa expresses time amount and an axis of ordinate expresses an electrical potential difference. In this case, delay has arisen in the phase between a tracking error signal and a tracking driving signal as a property of the compensator of the tracking control circuit 9 in the case where an objective lens 26 crosses a pit in the direction of tracking in the direction of a periphery, and moves [of a disk 1] to it from inner circumference after layer jump termination like drawing 7 (a) to it. It is made to output only the tracking error signal which works so that migration in the direction of tracking where control of a **** tracking error signal produces this COUT signal after layer jump termination by layer jump may be controlled, and he intercepts the tracking error signal which works so that migration may be promoted, and was trying not to output it in the case of the example of drawing 14 . In the example of drawing 16 , if a polarity is reversed, the tracking error signal which works so that this migration may be promoted will come to work so that migration may be controlled conversely. this uses, and if the output of circuit-changing-switch 19b outputs the signal which reversed the tracking error signal outputted from a digital disposal circuit 7 in the input inverter circuit 39, this tracking error signal outputs in LOW and a tracking control circuit 9 supplies when falling of a TZC signal or the COUT signal which started, came out and latched the mirror signal are HIGH, the tracking driving signal with which a phase was in the output from this tracking control circuit 9 will be outputted. Although the delay of a phase is between a tracking error signal and a tracking driving signal, it can consider as the signal which controls migration in the direction of tracking which always produces an output by layer jump.

[0050] As explained above, in case a layer jump is performed according to this example, can impress always proper acceleration voltage also to a noise also to field blurring, and it is making. A rise electrical potential difference required to move to other layers or a downward electrical potential difference is controlled by a layer switching and detecting a point appropriately, and a layer jump can be performed stably. And it can control that an objective lens moves in the direction of tracking by intercepting the unnecessary tracking error signal after jumping, and drawing in of tracking control can be carried out early. The optical disk unit which carries out reading of the data from the optical disk after a layer jump early and which can carry out things is realizable.

[0051]

[Effect of the Invention] In case (1) layer jump which does the following effectiveness so is performed

according to above this invention, impression of always proper acceleration voltage is enabled also to a noise also to field blurring, and a layer jump can be performed stably.
[0052] (2) Acceleration voltage required for a layer to switch, detect a point and move to other layers is controllable.
[0053] (3) At the time of termination of a layer jump, migration of an unnecessary objective lens can be controlled, drawing in of tracking control can be carried out early, reading of the data from an optical disk is carried out early, and the thing of it can be carried out.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] The block diagram of the example of this invention
[Drawing 2] A two-layer disk and the schematic diagram of a layer jump
[Drawing 3] The example of the configuration of pickup, and the digital disposal circuit of a focus
[Drawing 4] The focal error signal over disk displacement
[Drawing 5] The example of the configuration of pickup, and the digital disposal circuit of tracking
[Drawing 6] The tracking error signal over a tracking gap
[Drawing 7] A COUT signal and a tracking error signal
[Drawing 8] The outline of a layer jump
[Drawing 9] The example of the layer jump control algorithm in a microcomputer
[Drawing 10] The block diagram of other examples of this invention
[Drawing 11] The example of a tracking control circuit
[Drawing 12] The example of a signal when phase lag is in a control system
[Drawing 13] The block diagram of other examples of this invention
[Drawing 14] The block diagram of other examples of this invention
[Drawing 15] The example of a signal of other examples of this invention
[Drawing 16] The block diagram of other examples of this invention
[Description of Notations]
A recording surface is a certain disk more than two-layer to 1-one side.
2a-clamper
2b-turntable
3-pickup
4-leading screw
5-thread motor
6-spindle motor
7-digital disposal circuit
8-focus control circuit
9-tracking control circuit
10-thread control circuit
11-spindle control circuit
12-focus zero cross detector
13-microcomputer
14-low pass filter
15-rise electrical-potential-difference value setting circuit
16-downward electrical-potential-difference setting circuit
17-adder
18-potential switch.
19a, a 19b-circuit changing switch

20a, a 20b-ON/OFF switch
21-circuit changing switch
22a, a before [22b-] value holding circuit
23-output middle point setting circuit
24-TZC generation circuit
25-COUT generation circuit
26-objective lens
27-half prism
28 -- Semiconductor laser
29-photodetector
The error computing element for 30-focus error signal generation
31-diffraction grating
32a, the photodetector for 32b-tracking error signal generation
The error computing element for 33-tracking error signal generation
34-Maine laser
35, 36-sublaser
37-pit
38-land (mirror plane of an optical disk)
39-output inverter circuit

[Translation done.]

* NOTICES *

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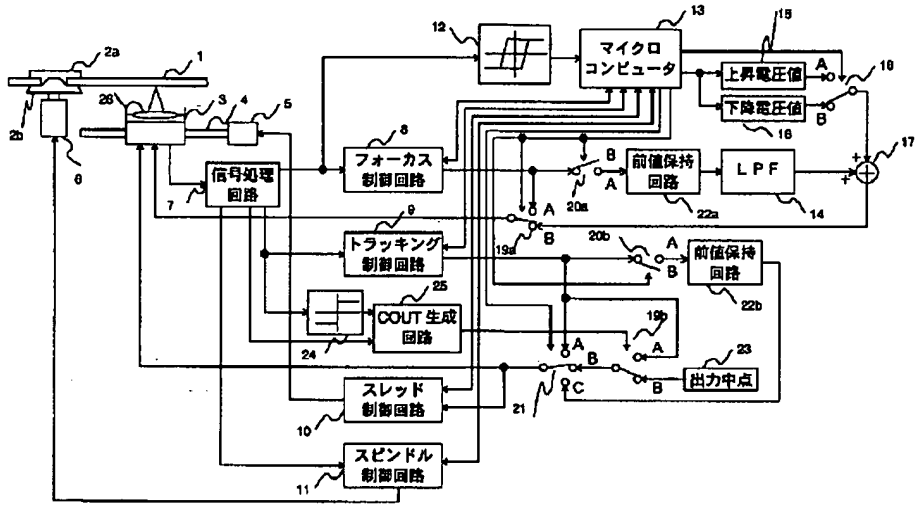
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

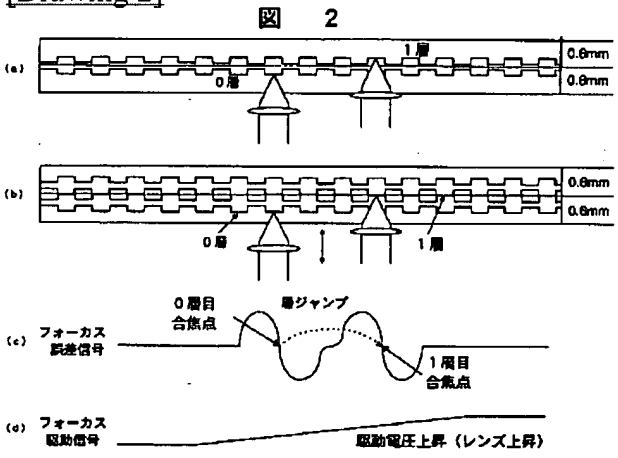
[Drawing 1]

図 1



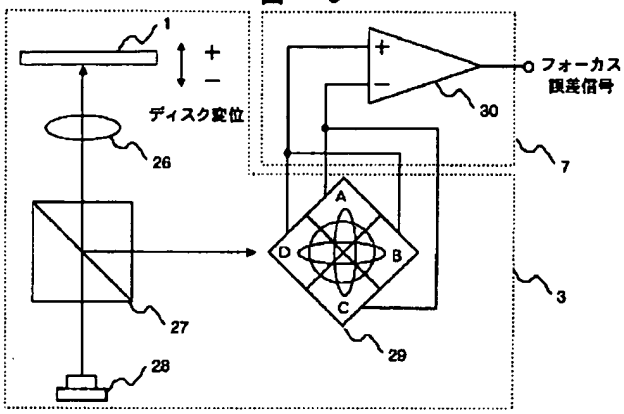
[Drawing 2]

図 2



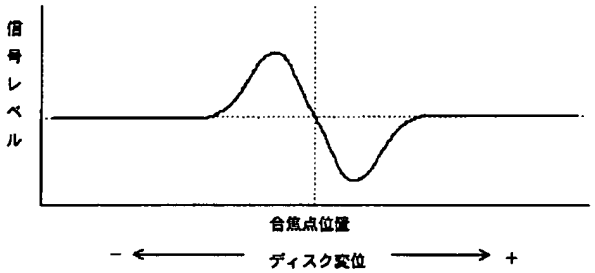
[Drawing 3]

図 3



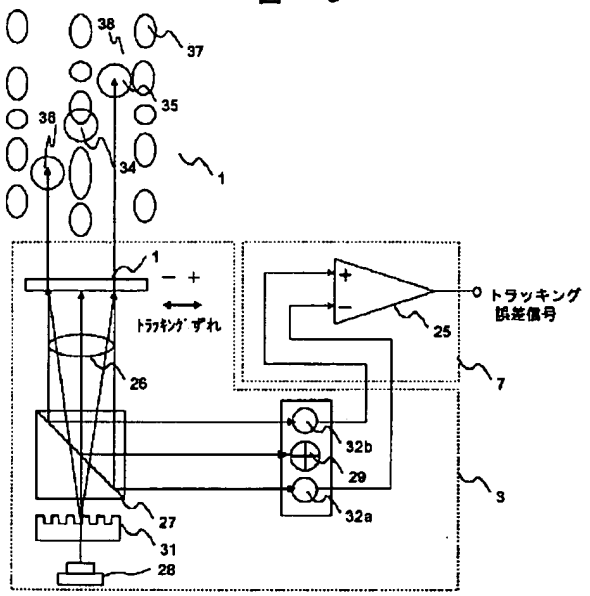
[Drawing 4]

図 4



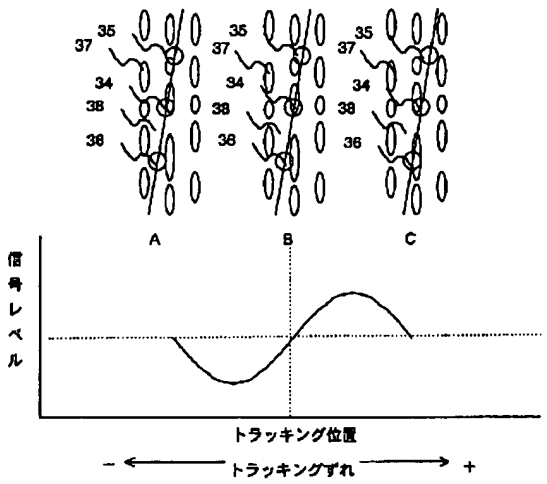
[Drawing 5]

図 5



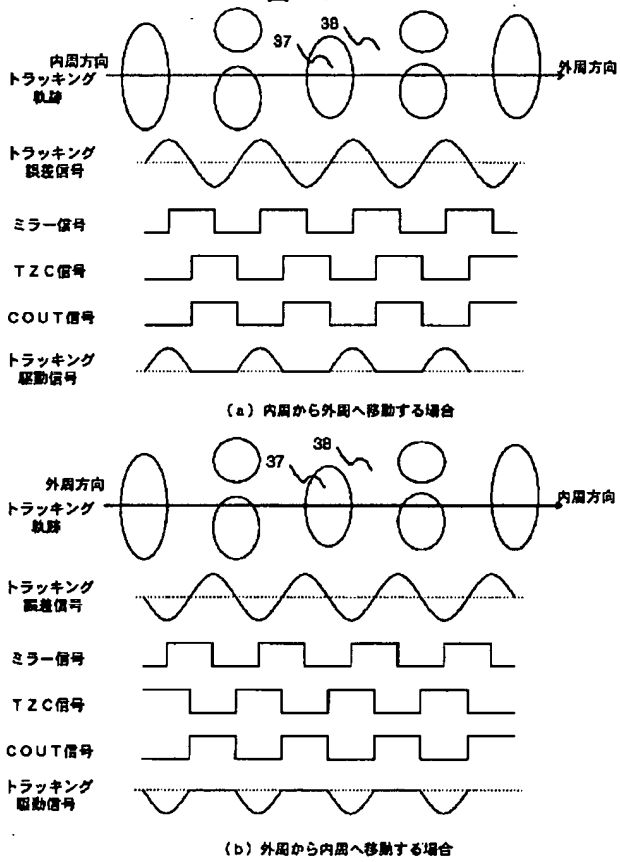
[Drawing 6]

図 6



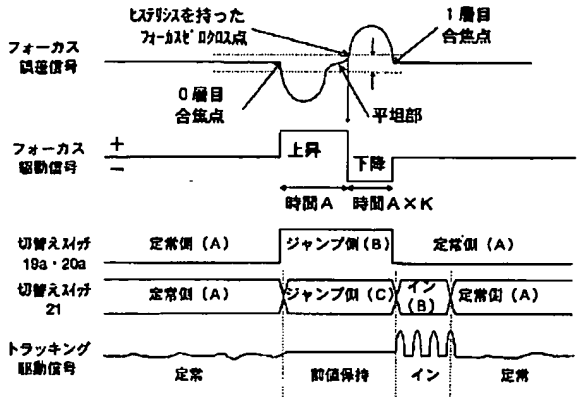
[Drawing 7]

図 7

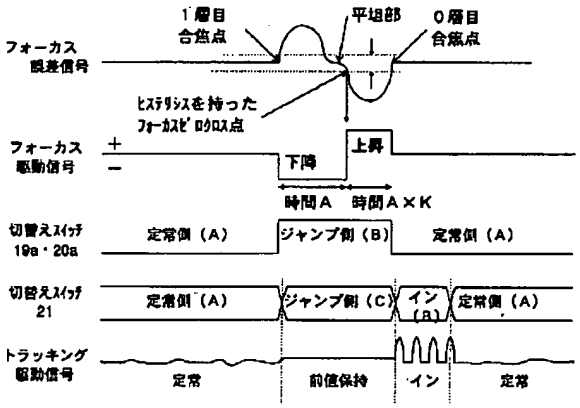


[Drawing 8]

図 8



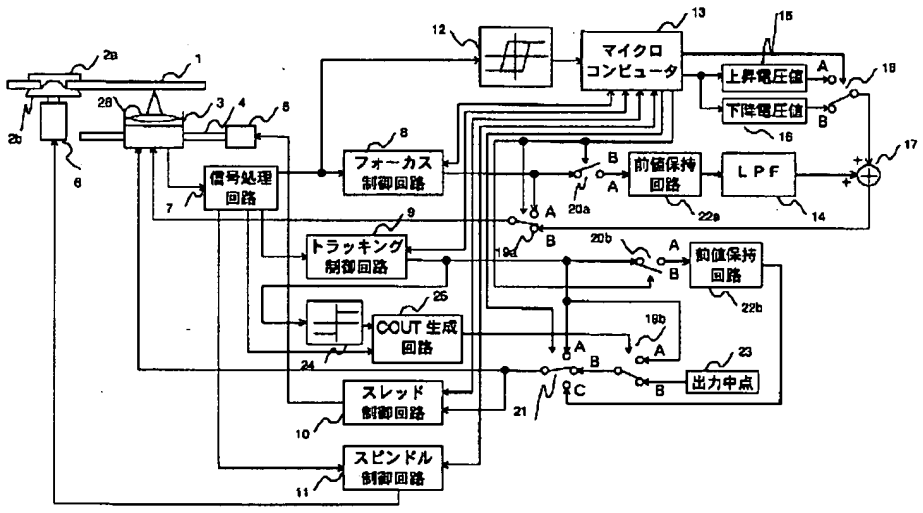
（a）0層から1層への層ジャンプ



（b）1層から0層への層ジャンプ

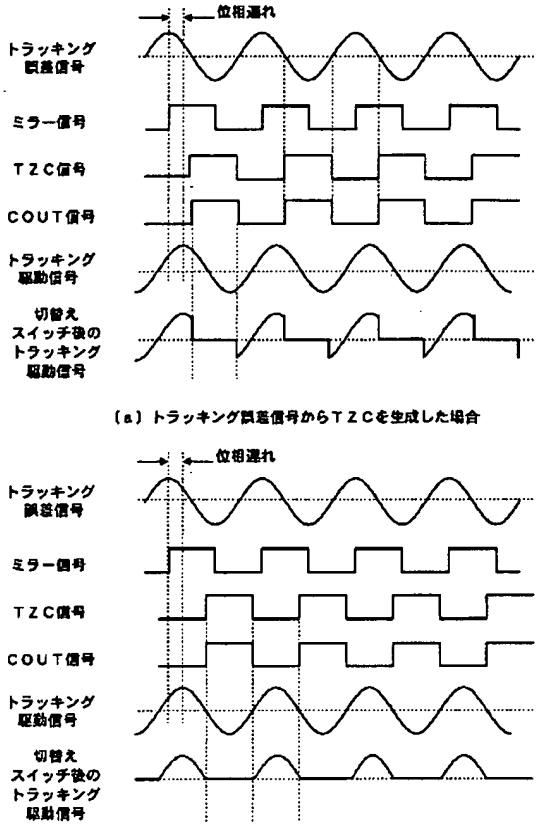
[Drawing 10]

図 10



[Drawing 12]

図 12

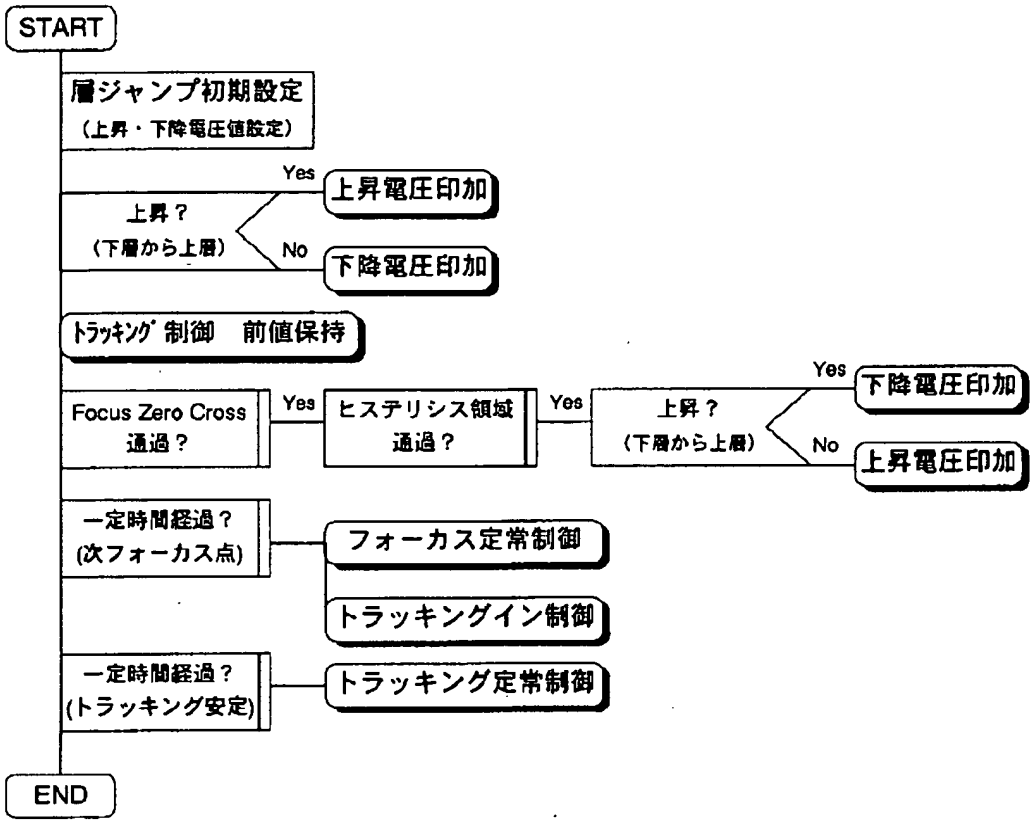


(a) トラッキング誤差信号からTZCを生成した場合

(b) トラッキング駆動信号からTZCを生成した場合

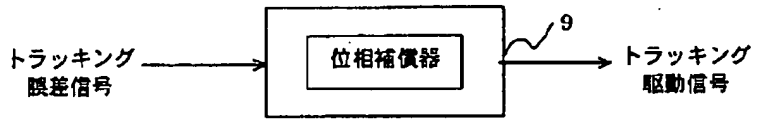
[Drawing 9]

図 9



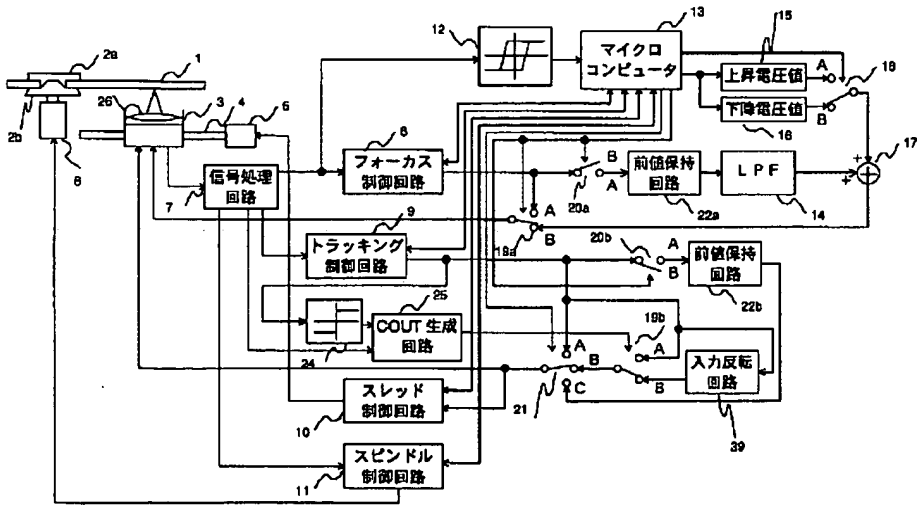
[Drawing 11]

図 11



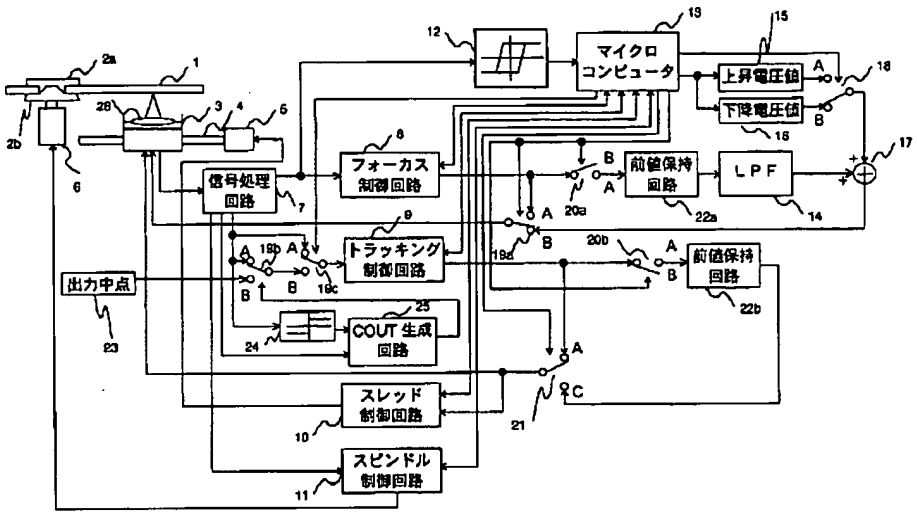
[Drawing 13]

図 13



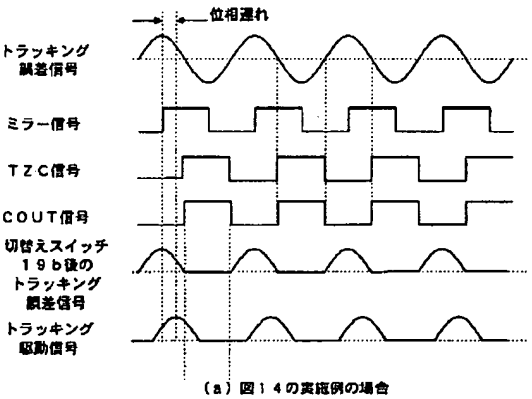
[Drawing 14]

図 14

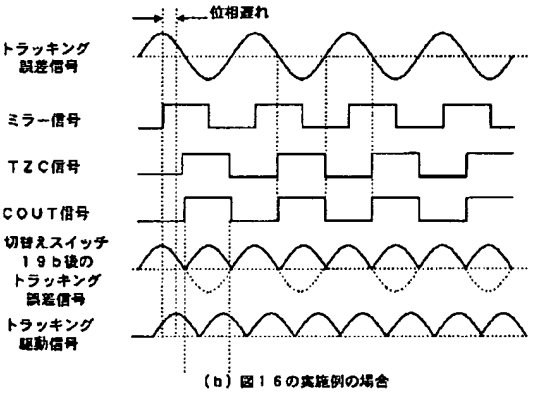


[Drawing 15]

図 15



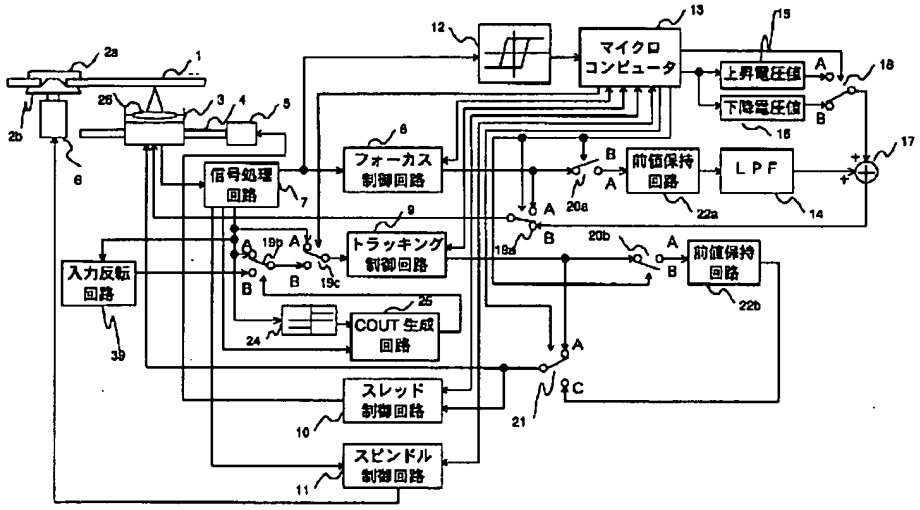
(a) 図14の実施例の場合



(b) 図16の実施例の場合

[Drawing 16]

図 16



[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CORRECTION OR AMENDMENT

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[Procedure revision]
[Filing Date] March 15, Heisei 14 (2002. 3.15)
[Procedure amendment 1]
[Document to be Amended] Specification
[Item(s) to be Amended] The name of invention
[Method of Amendment] Modification
[Proposed Amendment]
[Title of the Invention] An optical disk unit and the tracking control approach
[Procedure amendment 2]
[Document to be Amended] Specification
[Item(s) to be Amended] Claim
[Method of Amendment] Modification
[Proposed Amendment]
[Claim(s)]
[Claim 1] It is the optical disk unit in which record or playback is possible optically to the optical disk which has the recording layer in which record or playback is possible more than two-layer from one direction,

The laser light source which oscillates a laser beam,
The objective lens which condenses said laser beam on said optical disk,
The driving means which moves this objective lens in the direction of a focus, or the direction of tracking,
An operation means to calculate a tracking error signal from the reflected light from said optical disk,
A tracking driving signal generation means to generate a tracking driving signal based on said tracking error signal,
An electrical-potential-difference value setting means to supply the electrical-potential-difference value which keeps away said objective lens from the electrical-potential-difference value or optical disk put close to said optical disk in the case of a layer jump to said driving means,
The value maintenance means before holding the tracking driving signal from this tracking driving signal generation means,
The switch which suspends supply of the tracking driving signal to said maintenance means in the case of a layer jump,
An output middle point setting means by which the tracking driving signal beforehand set up so that it might become a middle point output was held,
The control means which chooses in order of the 1st control which uses the tracking driving signal from said tracking driving signal generation means in the case of a layer jump, and controls said driving means at it, the 2nd control which control said driving means using the tracking driving signal held at said maintenance means, the 3rd control which control said driving means using the tracking driving signal held at said output middle point setting means, and control [of ** said 1st] **, and controls said driving means,
The optical disk unit characterized by providing.
[Claim 2] In an optical disk unit according to claim 1,
Said control means,
Said 3rd control is performed immediately after a layer jump,
Next, said 2nd control is performed,
Then, the optical disk unit characterized by performing said 1st control.
[Claim 3] It is the optical disk unit in which record or playback is possible optically to the optical disk which has the recording layer in which record or playback is possible more than two-layer from one direction,
The objective lens for doubling the focus of a laser beam with the recording layer of a disk,
A migration means to move this objective lens in the direction of a focus according to a focal driving signal, and to make it drive in the direction of tracking according to a tracking driving signal, and to make a focus trace on the pit on a recording layer,
A noise rejection means to remove and output the noise component of said focal driving signal,
The electrical-potential-difference means for switching which switches any of the driver voltage value for bringing said objective lens close to said optical disk, or driver voltage ** for keeping away they are, and is supplied to said migration means,
An addition means to add the output of said noise rejection means, and the output of said electrical-potential-difference means for switching,
A layer change-over check appearance means for the layer produced when said focus carries out a layer jump to switch, and to detect a point,
The control means which controls said electrical-potential-difference means for switching by the detecting signal of this layer change-over check appearance means,
A change-over signal generation means to generate and output a change-over signal from the phase relation between the tracking error signal showing the amount of gaps of said focus and truck, and the distinction signal showing whether said focus is on a pit, or it is on a land,
The means for switching which switches any of said tracking driving signal or middle point tracking driving signal ** they are with said change-over signal, and is outputted,
It ****,

The optical disk unit characterized by to control said means for switching by giving the output signal of said addition means to said migration means, and to give a tracking driving signal to said migration means by it when said focus is compulsorily moved to other recording layers and the output of said electrical-potential-difference means for switching is moved to a change and other recording layers in said change-over rate point in case a focus is moved to other recording layers from the recording layer which already has a focus.

[Claim 4] It is the optical disk unit in which record or playback is possible optically to the optical disk which has the recording layer in which record or playback is possible more than two-layer from one direction,

The objective lens for doubling the focus of a laser beam with the recording layer of a disk,

The 1st migration means which moves this objective lens in the direction of a focus according to a focal driving signal,

The 2nd migration means which moves said objective lens in the direction of tracking according to a tracking driving signal, and makes a focus trace on the pit on a recording layer,

A change-over signal generation means to generate and output a change-over signal from the phase relation between the tracking error signal showing the amount of gaps of said focus and truck, and the distinction signal showing whether said focus is on a pit, or it is on a land,

A tracking driving signal generation means to generate and output said tracking driving signal,

A maintenance means to hold the output of this tracking driving signal generation means,

The 1st means for switching which switches any of the output signal of said tracking driving signal generation means, or middle point tracking driving signal ** they are with said change-over signal, and is outputted,

The 2nd means for switching which switches any of the output signal of this 1st means for switching, the output signal of said tracking driving signal generation means, and output signal [of said maintenance means] ** they are, and is outputted,

A means to control the output of this 2nd means for switching,

It ****,

The optical disk unit characterized by controlling said 1st and 2nd means for switching, and giving the tracking driving signal under focal migration, or the tracking driving signal at the time of migration termination to said migration means in case a focus is moved to other recording layers from the recording layer which already has a focus.

[Claim 5] It is the optical disk unit in which record or playback is possible optically to the optical disk which has the recording layer in which record or playback is possible more than two-layer from one direction,

The objective lens for doubling the focus of a laser beam with the recording layer of a disk,

The 1st migration means which moves this objective lens in the direction of a focus according to a focal driving signal,

The 2nd migration means which moves said objective lens in the direction of tracking according to a tracking driving signal, and makes a focus trace on the pit on a recording layer,

A noise rejection means to remove and output the noise component of said focal driving signal,

The fixed driver voltage value for bringing said objective lens close to said optical disk temporarily, or the electrical-potential-difference means for switching which switches any of fixed driver voltage ** for keeping away they are, and is supplied to said migration means,

An addition means to add the output of said noise rejection means, and the output of said electrical-potential-difference means for switching,

A layer change-over check appearance means for the layer produced when said focus carries out a layer jump to switch, and to detect a point,

The control means which controls said electrical-potential-difference means for switching by the detecting signal of this layer change-over check appearance means,

A tracking driving signal generation means to generate and output said tracking driving signal from the tracking error signal showing the amount of gaps of said focus and truck,

A change-over signal generation means to generate and output a change-over signal from phase relation with the distinction signal showing whether this tracking driving signal and said focus are on a pit, or it is on a land,
The means for switching which switches any of the output signal of said tracking driving signal generation means, or middle point tracking driving signal ** they are with said change-over signal, and is outputted,
It ****,
In case a focus is moved to other recording layers from the recording layer which already has a focus, the output signal of said addition means by giving said migration means Compulsorily, make it move to other recording layers, and said focus is set at said change-over rate point. The optical disk unit characterized by controlling said means for switching and giving a tracking driving signal to said migration means when the fixed electrical-potential-difference value given to a migration means was controlled, and said focus is drawn in other recording layers and it moves to other recording layers.
[Claim 6] It is the optical disk unit in which record or playback is possible optically to the optical disk which has the recording layer in which record or playback is possible more than two-layer from one direction,
The objective lens for doubling the focus of a laser beam with the recording layer of a disk,
The 1st migration means which moves this objective lens in the direction of a focus according to a focal driving signal,
The 2nd migration means which moves said objective lens in the direction of tracking according to a tracking driving signal, and makes a focus trace on the pit on a recording layer,
A tracking driving signal generation means to generate and output said tracking driving signal,
A maintenance means to hold the output of said tracking driving signal generation means,
A change-over signal generation means to generate and output a change-over signal from phase relation with the distinction signal showing whether said tracking driving signal and said focus are on a pit, or it is on a land,
The 1st means for switching which switches any of the output signal of said tracking driving signal generation means, or middle point tracking driving signal ** they are with said change-over signal, and is outputted,
The 2nd means for switching which switches any of the output signal from this 1st means for switching, the output signal of said tracking driving signal generation means, and output signal [of said maintenance means] ** they are, and is outputted,
A means to control the output of this 2nd means for switching,
It ****,
The optical disk unit characterized by controlling said 1st and 2nd means for switching, and giving the tracking driving signal under focal migration, or the tracking driving signal at the time of migration termination to said migration means in case a focus is moved to other recording layers from the recording layer which already has a focus.
[Claim 7] It is the optical disk unit in which record or playback is possible optically to the optical disk which has the recording layer in which record or playback is possible more than two-layer from one direction,
The objective lens for doubling the focus of a laser beam with the recording layer of a disk,
The 1st migration means which moves this objective lens in the direction of a focus according to a focal driving signal,
The 2nd migration means which moves said objective lens in the direction of tracking according to a tracking driving signal, and makes a focus trace on the pit on a recording layer,
A noise rejection means to remove and output the noise component of said focal driving signal,
The fixed driver voltage value for bringing said objective lens close to said optical disk temporarily, or the electrical-potential-difference means for switching which switches any of fixed driver voltage ** for keeping away they are, and is supplied to said migration means,
An addition means to add the output of said noise rejection means, and the output of said electrical-

potential-difference means for switching,
A layer change-over check appearance means for the layer produced when said focus carries out a layer jump to switch, and to detect a point,
The control means which controls said electrical-potential-difference means for switching by the detecting signal of this layer change-over check appearance means,
A tracking driving signal generation means to generate and output said tracking driving signal from the tracking error signal showing the amount of gaps of said focus and truck,
A reversal means to reverse and output the polarity of the output of this tracking driving signal generation means,
A change-over signal generation means to generate and output a change-over signal from phase relation with the distinction signal showing whether this tracking driving signal and said focus are on a pit, or it is on a land,
The means for switching which switches any of the output signal of said tracking driving signal generation means, or output signal [of said reversal means] ** they are with said change-over signal, and is outputted,
It ****,
In case a focus is moved to other recording layers from the recording layer which already has a focus, the output signal of said addition means by giving said migration means Compulsorily, make it move to other recording layers, and said focus is set at said change-over rate point. The optical disk unit characterized by controlling said means for switching and giving a tracking driving signal to said migration means when the fixed electrical-potential-difference value given to a migration means was controlled, and said focus is drawn in other recording layers and it moves to other recording layers.
[Claim 8] It is the optical disk unit in which record or playback is possible optically to the optical disk which has the recording layer in which record or playback is possible more than two-layer from one direction,
The objective lens for doubling the focus of a laser beam with the recording layer of a disk,
The 1st migration means which moves this objective lens in the direction of a focus according to a focal driving signal,
The 2nd migration means which moves said objective lens in the direction of tracking according to a tracking driving signal, and makes a focus trace on the pit on a recording layer,
A tracking driving signal generation means to generate and output said tracking driving signal from the tracking error signal showing the amount of gaps of said focus and truck,
A reversal means to reverse and output the polarity of said tracking driving signal,
A maintenance means to hold the output of said tracking driving signal generation means,
A change-over signal generation means to generate and output a change-over signal from phase relation with the distinction signal showing whether said tracking driving signal and said focus are on a pit, or it is on a land,
The 1st means for switching which switches any of the output signal of said tracking driving signal generation means, or output signal [of said reversal means] ** they are with said change-over signal, and is outputted,
The 2nd means for switching which switches any of the output signal of this 1st means for switching, the output signal of said tracking driving signal generation means, and output signal [of said maintenance means] ** they are, and is outputted,
A means to control the output of this 2nd means for switching,
It ****,
The optical disk unit characterized by controlling said 1st and 2nd means for switching, and giving the tracking driving signal under focal migration, or the tracking driving signal at the time of migration termination to said migration means in case a focus is moved to other recording layers from the recording layer which is already in a focus.
[Claim 9] It is the optical disk unit in which record or playback is possible optically to the optical disk which has the recording layer in which record or playback is possible more than two-layer from one

direction,
The objective lens for doubling the focus of a laser beam with the recording layer of a disk,
The 1st migration means which moves this objective lens in the direction of a focus according to a focal driving signal,
The 2nd migration means which moves said objective lens in the direction of tracking according to a tracking driving signal, and makes a focus trace on the pit on a recording layer,
A noise rejection means to remove and output the noise component of said focal driving signal,
The fixed driver voltage value for bringing said objective lens close to said optical disk temporarily, or the electrical-potential-difference means for switching which switches any of fixed driver voltage ** for keeping away they are, and is supplied to said migration means,
An addition means to add the output of said noise rejection means, and the output of said electrical-potential-difference means for switching,
A layer change-over check appearance means for the layer produced when said focus carries out a layer jump to switch, and to detect a point,
The control means which controls said electrical-potential-difference means for switching by the detecting signal of this layer change-over check appearance means,
A change-over signal generation means to generate and output a change-over signal from the phase relation between the tracking error signal showing the amount of gaps of said focus and truck, and the distinction signal showing whether said focus is on a pit, or it is on a land,
The means for switching which switches any of this tracking error signal or middle point tracking error signal ** they are with said change-over signal, and is outputted,
A tracking driving signal generation means to generate and output said tracking driving signal from the tracking error signal outputted by this means for switching,
It ****,
In case a focus is moved to other recording layers from the recording layer which already has a focus, the output signal of said addition means by giving said migration means Compulsorily, make it move to other recording layers, and said focus is set at said change-over rate point. The optical disk unit characterized by controlling said means for switching and giving a tracking driving signal to said migration means when the fixed electrical-potential-difference value given to a migration means was controlled, and said focus is drawn in other recording layers and it moves to other recording layers.
[Claim 10] It is the optical disk unit in which record or playback is possible optically to the optical disk which has the recording layer in which record or playback is possible more than two-layer from one direction,
The objective lens for doubling the focus of a laser beam with the recording layer of a disk,
The 1st migration means which moves this objective lens in the direction of a focus according to a focal driving signal,
The 2nd migration means which moves said objective lens in the direction of tracking according to a tracking driving signal, and makes a focus trace on the pit on a recording layer,
A change-over signal generation means to generate and output a change-over signal from the phase relation between the tracking error signal showing the amount of gaps of said focus and truck, and the distinction signal showing whether said focus is on a pit, or it is on a land,
The 1st means for switching which switches any of said tracking error signal or middle point tracking error signal ** they are with said change-over signal, and is outputted,
The 2nd means for switching which switches any of the output signal from this 1st means for switching, or said tracking error signal ** they are, and is outputted,
A tracking driving signal generation means to generate said tracking driving signal from the tracking error signal outputted from this 2nd means for switching,
A maintenance means to hold the output of this tracking driving signal generation means,
The 3rd means for switching which switches any of the output signal of said tracking driving signal generation means, or output signal [of said maintenance means] ** they are, and is outputted,
The control means which controls the output of this 2nd and 3rd means for switching,

It ****,
The optical disk unit characterized by controlling said 1st, 2nd, and 3rd means for switching, and giving the tracking driving signal under focal migration, or the tracking driving signal at the time of migration termination to said migration means in case a focus is moved to other recording layers from the recording layer which is already in a focus.
[Claim 11] It is the optical disk unit in which record or playback is possible optically to the optical disk which has the recording layer in which record or playback is possible more than two-layer from one direction,
The objective lens for doubling the focus of a laser beam with the recording layer of a disk,
The 1st migration means which moves this objective lens in the direction of a focus according to a focal driving signal,
The 2nd migration means which moves said objective lens in the direction of tracking according to a tracking driving signal, and makes a focus trace on the pit on a recording layer,
A noise rejection means to remove and output the noise component of said focal driving signal,
The fixed driver voltage value for bringing said objective lens close to said optical disk temporarily, or the electrical-potential-difference means for switching which switches any of fixed driver voltage ** for keeping away they are, and is supplied to said migration means,
An addition means to add the output of said noise rejection means, and the output of said electrical-potential-difference means for switching,
A layer change-over check appearance means for the layer produced when said focus carries out a layer jump to switch, and to detect a point,
The control means which controls said electrical-potential-difference means for switching by the detecting signal of this layer change-over check appearance means,
A reversal means to reverse and output the polarity of the tracking error signal showing the amount of gaps of said focus and truck,
A change-over signal generation means to generate and output a change-over signal from the phase relation between said tracking error signal and the distinction signal showing whether said focus is on a pit, or it is on a land,
The means for switching which switches any of said tracking error signal or output signal [of said reversal means] ** they are with said change-over signal, and is outputted,
A tracking driving signal generation means to generate and output said tracking driving signal from the tracking error signal outputted by this means for switching,
It ****,
In case a focus is moved to other recording layers from the recording layer which already has a focus, the output signal of said addition means by giving said migration means Compulsorily, make it move to other recording layers, and said focus is set at said change-over rate point. The optical disk unit characterized by controlling said means for switching and giving a tracking driving signal to said migration means when the fixed electrical-potential-difference value given to a migration means was controlled, and said focus is drawn in other recording layers and it moves to other recording layers.
[Claim 12] It is the optical disk unit in which record or playback is possible optically to the optical disk which has the recording layer in which record or playback is possible more than two-layer from one direction,
The objective lens for doubling the focus of a laser beam with the recording layer of a disk,
The 1st migration means which moves this objective lens in the direction of a focus according to a focal driving signal,
The 2nd migration means which moves said objective lens in the direction of tracking according to a tracking driving signal, and makes a focus trace on the pit on a recording layer,
A reversal means to reverse and output the polarity of the tracking error signal showing the amount of gaps of said focus and truck,
A change-over signal generation means to generate and output a change-over signal from the phase relation between said tracking error signal and the distinction signal showing whether said focus is on a

pit, or it is on a land,
The 1st means for switching which switches any of said tracking error signal or output signal [of said reversal means] ** they are with said change-over signal, and is outputted,
The 2nd means for switching which switches any of the output signal from this 1st means for switching, or said tracking error signal ** they are, and is outputted,
A tracking driving signal generation means to generate said tracking driving signal from the tracking error signal outputted by this 2nd means for switching,
A maintenance means to hold the output of this tracking driving signal generation means,
The 3rd means for switching which switches any of the output signal of said tracking driving signal generation means, or output signal [of said maintenance means] ** they are, and is outputted,
The control means which controls the output of this 2nd and 3rd means for switching,
It ****,
The optical disk unit characterized by controlling said 1st, 2nd, and 3rd means for switching, and giving the tracking driving signal under focal migration, or the tracking driving signal at the time of migration termination to said migration means in case a focus is moved to other recording layers from the recording layer which is already in a focus.
[Claim 13] It is the tracking control approach [in / to the optical disk which has the recording layer in which record or playback is possible more than two-layer from one direction / the optical disk unit in which record or playback is possible] optically,
The tracking control approach characterized by controlling by the tracking driving signal which chose the tracking control in the case of a layer jump in order of tracking driving signal ** controlled based on the tracking driving signal controlled based on the tracking error signal, the tracking driving signal held before the layer jump, the output zero signal, and the tracking error signal.

[Translation done.]